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THE OPERATIVE TREATMENT OF CARCINOMA OF THE ŒSOPHAGUS*

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WITH the exception of some successes in the cervical portion, the treatment of carcinoma of the œsophagus has, until recently, been a total failure and is still very unsatisfactory. Though definite proof of the possibility of successful surgical removal of the carcinomatous œsophagus has been furnished within the last two years, nevertheless, even at the present day, cases, as they are brought to the attention of the surgeon, are almost invariably in an advanced stage of the disease. This is accounted for by the fact that the patients afflicted with this disease consult their physicians mainly on account of one solitary symptom, the inability to swallow solid food, and that is a late symptom. Pain on deglutition, or independently of swallowing, is also a late symptom. In early and even moderately advanced cases there is, as a rule, no pain; when that symptom occurs, it usually signifies that the disease has extended beyond the limits of the œsophagus and that operative removal is no longer to be considered. The absence of symptoms previous to the time when the passage has become obstructed explains why, at the present time, an early case of carcinoma of the œsophagus is practically unknown to the surgeon. The earlier symptom, temporary disturbance of deglutition, probably due to inflammatory swelling in the vicinity of the small carcinoma, does not receive serious attention on the part of the patient, and, when the swelling has subsided and deglutition is again unimpeded, he will not be inclined to consent to an operation, particularly not an operation involving considerable risk. Thus it happens that the great majority of cases of carcinoma of the œsophagus that we see are inoperable.

Diagnosis.—It is not the object of this paper to enter into the details of the diagnosis of the disease. Let it suffice, therefore, to say that besides the subjective symptoms mentioned above we gather the information derived from the passage of sounds, from röntgenograms, and

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by œsophagoscopy to aid us in determining the presence and location of the carcinoma. However, I wish to call attention to the danger of removing a section for pathological diagnosis. By this procedure, especially if it is repeated, a slowly growing tumor may be stimulated to more rapid growth.

Operative Results.—The cervical portion of the œsophagus has been attacked surgically a number of times with a successful issue as far as recovery from the operation is concerned. One case was reported by v. Hacker, 1½ years after operation, to be free from recurrence; all other cases died from recurrences of the disease.

The resection of the abdominal portion of the œsophagus has been attended with success three times—Völcker in 1907, Kümmel in 1909, and Zaaier in 1913. Of these three, however, the œsophagus was not affected in the first two; they were carcinomata of the cardiac end of the stomach, the removal of which required resection of the abdominal portion of the œsophagus. In Völcker's case, a woman sixty-four years old, the obstruction was met at a distance of 46 cm. from the incisors, an exceptionally long stretch, when we consider that the average distance from the teeth to the cardiac end of the œsophagus in women is below 40 cm. Kümmel's case, likewise, is described as a carcinoma of the cardia pure and simple. He sutured the œsophagus to the stomach over the two arms of a T-tube, the leg of which was brought out of the abdominal wound for purposes of feeding. Although it may be difficult, perhaps sometimes impossible, to make a sharp anatomical distinction by gross inspection, whether a carcinoma of the cardia has or has not involved the lowermost end of the œsophagus, this question is of practical importance only where the œsophagus is distinctly involved; for it certainly does make a difference, in the technical aspect of the task before us, whether the œsophagus is involved or not. Völcker and Kümmel operated entirely from the abdomen, a procedure which requires the œsophagus to be liberated out of the hiatus œsophagus and drawn down as much as possible into the abdomen. These two surgeons describe the great difficulty they experienced in bringing the œsophagus down far enough to suture it to the stomach. In case of an involvement of the œsophagus itself this difficulty would, of course, be much increased, and it would be well-nigh impossible to liberate the œsophagus and bring it down far enough to operate from the abdominal side. In Zaaier's case, likewise one of carcinoma of the cardiac end of the stomach, the lowermost portion of the œsophagus is described as being involved, although in his case also the bougie met the obstruction low down, 45 cm. from the teeth, *i.e.*, a few centimetres lower than the

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average distance of the lower end of the œsophagus from the incisors. Zaaïjer did not operate through the abdomen alone, but by a combined abdomino-thoracic method to be described later. Therefore, while we acknowledge that Völcker's and Kümmel's operations were very remarkable surgical achievements, it is but just to credit the first successful removal of a carcinoma of the abdominal portion of the œsophagus to Zaaïjer.

Carcinoma of the thoracic œsophagus has been operated on successfully but once, my own case; the patient is well and free from recurrence, 20½ months after operation. It should be mentioned, however, that a few cases have lived about two weeks before they succumbed to the results of the operation.

Anatomical Points.—Before proceeding to the description of the operative methods it may be well to call to mind a few anatomical points. In the neck, the œsophagus lies in front of the spinal column and behind the trachea, a little farther to the left than that organ. In the thorax the same relation obtains, except that the œsophagus deviates a trifle more to the left. Near the bifurcation of the trachea the transverse portion of the arch of the aorta is encountered, which, here, is separated from the œsophagus by the trachea. Then, as the arch of the aorta crosses the left bronchus, it lies to the left of the œsophagus, and the upper part of the descending aorta lies behind and to the left of the œsophagus. Considering the relative position of the three organs, aorta, trachea or bronchus, and œsophagus, the aorta has passed from the front to the rear, so that the œsophagus now lies between the left bronchus and the aorta. Farther down, the œsophagus crosses over in front of the aorta to take its position to the left of that vessel in the lower part of the thorax. The aorta therefore may be said to twist spirally around the œsophagus.

The œsophagus receives its blood supply in the neck from branches of the inferior thyroid arteries; in the chest, from branches of the bronchial arteries and from the aorta itself; in the abdomen, from branches of the left gastric artery.

The lumen of the œsophagus is normally narrowed to some extent at certain places. The first narrowing is at the beginning of the œsophagus, behind the cricoid cartilage; the second, at the bifurcation of the trachea; the third, at the hiatus œsophagus of the diaphragm, or slightly above it. There may or may not be a narrowing at the upper thoracic aperture.

The average measurements, according to v. Hacker, are: For males, from the incisors to the beginning of the œsophagus, 15 cm.; to the bifurcation of the trachea, 25 cm.; to the cardia, 40 to 41 cm. For females, the figures are, respectively, 14, 24, and 38 to 39 cm. Variations of several centimetres, however, are not rare.

In the neck, the recurrent laryngeal nerve runs upward in the gutter between the œsophagus and the trachea. The structures in front of the lateral border of the œsophagus are the skin and superficial fascia, the platysma, the sternocleidomastoid, sternohyoid, and omohyoid muscles, the thyroid gland, and the middle layer of the deep cervical fascia which is continuous with the capsule

of the thyroid gland mesially and with the sheath of the great vessels laterally. Attention to the deep cervical lymphatic nodes is of importance in cases of carcinoma of the cervical portion of the œsophagus. There are two sets of nodes, the superior, along the upper part of the internal jugular vein, in the neighborhood of the bifurcation of the common carotid artery, and the inferior, situated along the lower part of the internal jugular vein and in the supra-clavicular fossa, mainly in the angle formed by the subclavian and internal jugular veins. The inferior lymphatic nodes are usually affected later than the superior. On the left side the proximity of the thoracic duct to the inferior nodes, and the possible danger of wounding it, must be kept in mind.

In the thorax the thoracic duct lies behind the œsophagus in its upper part, but is rarely in direct contact with it; lower down, where the aorta pushes the œsophagus forward, the thoracic duct lies behind the aorta.

The pneumogastric nerves are in relation with the œsophagus from the arch of the aorta downward. The left vagus lies on the left and anterior wall of the œsophagus; the right nerve, on the right and posterior wall. In the lower half of its intrathoracic course the pneumogastric ceases to be a single nerve and divides into a number of anastomosing nerves, forming the anterior and posterior œsophageal plexuses.

The relation of the pleura to the œsophagus is different on the right side from that on the left. On the right side the pleura envelops the œsophagus, insinuating itself to some extent between the œsophagus and the spinal column, especially in its middle portion, causing the œsophagus to stand out more prominently than on the left side. It appears as if the right pleura were making a faint attempt to provide the œsophagus with a serous coat. On the left side the œsophagus does not stand out; the prominent features are the pericardium in front of it and the aorta behind it, the œsophagus lying in a depression between the two, manifesting itself only by a slight bulging, and even this may be absent. The pleura, on the left side, makes no attempt to envelop the œsophagus but simply passes from the pericardium across the œsophagus to the aorta, which latter it envelops in part.

Resection of the Cervical Portion of the Œsophagus.—A preliminary gastrostomy should be done to improve the patient's nutrition and enhance his powers of resistance, so as to render him better able to withstand the hardship of the operation. Subsequent to the operation the gastric fistula also protects him against some of the dangers of wound infection and other insults incident upon feeding through the cervical wound. By the elimination of feeding through the wound the dressing is also greatly simplified (compare my article, *Laryngectomy Combined with Gastrostomy, Surgery, Gynecology, and Obstetrics*, April, 1914).

The tumor must be removed by a circular resection of the œsophagus in lines at least 2 cm. distant from each end of the carcinoma. The deep cervical lymphatic nodes, that are affected or suspected of being involved, should be removed either at the time of the operation or at a later sitting. In advanced cases it may be necessary also to remove the larynx and part of the trachea. Great care must be exercised to

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avoid injury to the recurrent laryngeal nerves, the jugular and subclavian veins, and the thoracic duct.

As a rule, an attempt should be made to restore the œsophagus. One way of doing this (Ach's method) is to take a large broad skin flap from the neck (Fig. 1) and turn it upon itself so as to form a tube (Fig. 2), with the skin side inward. The two ends of this tube are sutured to the upper and lower divided ends of the œsophagus. The œsophageal tube is thus restored, except at the side, where the edge of the flap is turned back upon the flap. This part is tamponed; it is closed about two weeks later, and the raw surface is covered by a skin plastic.

Another method is v. Hacker's. In the first stage of this operation the skin flap is placed into the depth of the wound to form the posterior wall

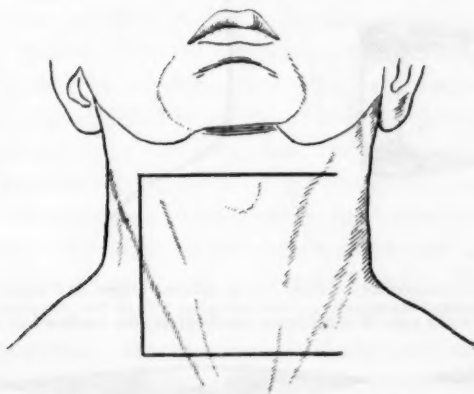


FIG. 1.—Resection of cervical œsophagus. Outline of flap for construction of new œsophagus, Ach's method.

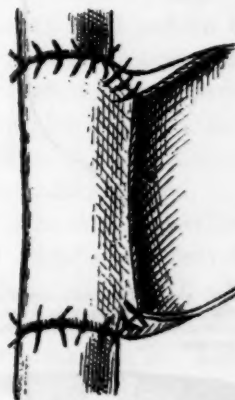


FIG. 2.—Flap outlined in Fig. 1 rolled up to form a tube, skin surface inside. One side of the tube, however, remains open. This is closed at a subsequent stage.

of the œsophagus (Fig. 3). The posterior halves of the upper and lower œsophagus stumps are sutured to the upper and lower borders of the flap, respectively. In the second stage, a skin flap is shaped on each side of the newly-made posterior wall of the œsophagus, and the two flaps are turned toward each other, edge to edge, and united to form a tube (Fig. 4). The tube, in turn, is covered by lateral skin flaps (Fig. 5) mobilized for the purpose.

The mortality is about 36 per cent., the most frequent causes of death being insufficient nutrition and resistance of the patient, cardiac failure, pneumonia, exhaustion, and wound infection causing sepsis or peri-œsophageal phlegmon and mediastinitis. Failure to achieve permanent cures is chiefly due to the advanced stage of the affection, many

cases having progressed beyond the œsophagus, involving especially the larynx and trachea. Failure to remove all affected lymphatic nodes is also a cause of unsatisfactory permanent results.

Resection of the Thoracic Portion of the Œsophagus.—Previous to the era of differential pressure in intrathoracic surgery, it was the aim to attack the œsophagus by entering the posterior mediastinum without

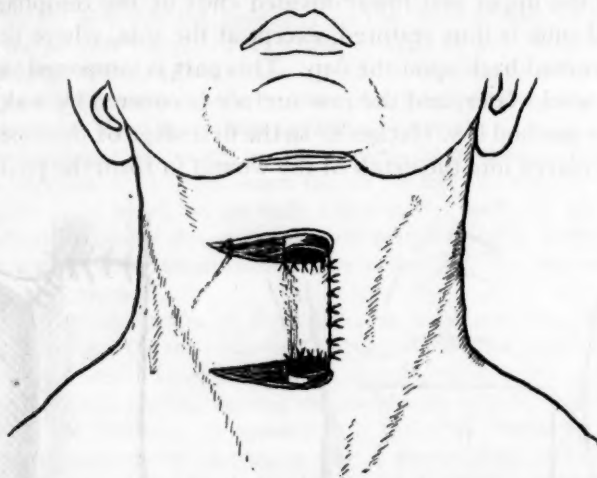


FIG. 3.—v. Hacker's method of œsophagoplasty. Skin flap is sutured above and below to posterior border of upper and lower stumps of œsophagus to form posterior wall of new œsophagus. In this and the two following figures, for the sake of simplifying the diagram, the trachea has not been represented.

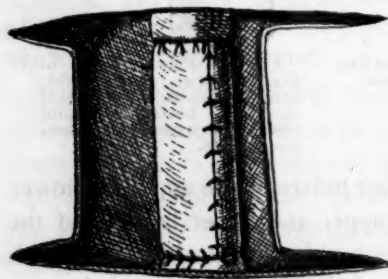


FIG. 4.—The construction of the œsophageal tube has been completed by turning two flaps, one from each side, toward each other and uniting them. One of these flaps is cut smaller than the other.

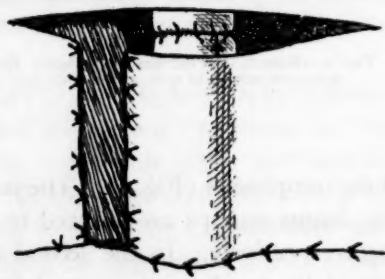


FIG. 5.—The new œsophagus is covered by a flap from that side from which the smaller flap of skin was taken to construct the œsophagus. This flap is sutured to the sternocleidomastoid muscle of the opposite side, and a flap from the opposite side is attached to the same muscle.

injury to the pleura. L. Rehn elaborated a method consisting in the formation of a flap including the posterior portions of the fourth to the eighth ribs, the flap having its base at the spine. Great caution is to be exercised to keep the pleura intact. Rehn resected a carcinomatous œsophagus by this method, but the issue was unsuccessful. The efforts

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at extrapleural resection are still being continued and are being watched with interest. The extrapleural route had been chosen in order to avoid the danger incident to pneumothorax caused by opening the pleural cavity. However, as there now exist methods of keeping the lungs inflated to any desired degree, while the thorax is open, the transpleural route of access to the œsophagus is generally preferred.

Differential Pressure.—One way of keeping the lungs inflated is by the use of differential pressure, either negative or positive, that is, either the pressure of the air on the outer surface of the lungs is diminished or the pressure of the inspired air is increased. Another way is the method of intratracheal insufflation (Meltzer-Auer) by which the anæsthetic or air is blown into the trachea by means of a catheter introduced through the larynx and attached to a specially constructed pump. The former of these methods requires that the patient's head and his body be in two different chambers, the partition wall being represented at the neck by a rubber cuff which embraces the neck. In my operation for transpleural resection of the œsophagus, in which it is necessary to operate upon the neck also, the presence of this cuff is objectionable. Therefore the method of intratracheal insufflation is employed.

Preparation of the Patient for Transpleural Resection of the Œsophagus.—Besides the preparation common to all major operations there is need of attention to certain details. The examination of the heart function is important. A coexisting chronic myocarditis is especially dangerous; arteriosclerosis of the peripheral vessels less so. Cardiac insufficiency requires appropriate treatment for a few days before operation. Anæmia calls for the exhibition of iron and quinine. Even slight catarrhal affections of the lungs require careful pre-operative treatment, such as moist packs and expectorants, possibly in combination with cardiants. Inhalations are efficacious in facilitating expectoration. Existing nose and throat affections should receive appropriate treatment.

Indications for Intrathoracic Resection of the Œsophagus.—To consider a case of carcinoma of the thoracic portion of the œsophagus fit for operation it is imperative, first, that no metastases exist. The abdominal organs, especially the liver, stomach, peritoneum, and the retroperitoneal lymphatic nodes, are searched for the presence of metastatic carcinoma at the time the preliminary gastrostomy is done. Second, as a rule, the disease should be circumscribed and limited to the œsophagus. An extension of the tumor to the neighboring organs—aorta, lungs, bronchi, pericardium, or thoracic wall—renders the attempt at its removal inadvisable, unless the extent of that involvement is so limited that it can also be removed. This question, as a rule, will not be decided

until the thorax has been opened. Furthermore, as the operation is a serious one, the patient's powers of resistance should not be too much depressed. Thus, cases of nephritis, chronic myocarditis, marked alcoholism, cirrhosis of the liver, etc., are poor subjects for the operation; also patients who fail to gain in weight after the preliminary gastrotomy has been done, or even continue to lose in weight, are unlikely to do well after the thoracic operation.

Methods of Operating Other Than My Own.—It is not my object to give an exhaustive account of all the methods of resecting the œsophagus that have been attempted. I shall merely touch upon the more important phases of some. For carcinoma of the lower part of the œsophagus there is Sauerbruch's method of anastomosis of the upper stump with the fundus of the stomach. Through an intercostal incision the œsophagus is freed from the diaphragm, which is divided sufficiently far to permit drawing a portion of the stomach into the thorax. The tumor is resected and the œsophagus anastomosed with the fundus of the stomach by the aid of Payr's tube or Tiegel's button. The stomach is then sutured to the diaphragm.

The cardinal error in these methods lies in the application of the principles of intestinal anastomosis to the œsophagus, an organ which possesses no serous coat. No plastic exudate will be thrown out from the muscular coat of the œsophagus, and we must expect, therefore, that when necrosis of the turned-in ends takes place, they will separate. In the case of the œsophagus we would have to depend, for anastomosis, upon a most accurate suture of raw surface to raw surface, and that is a rather difficult task.

Wendel's abdomino-thoracic procedure in cases of carcinoma of the cardia involving the œsophagus consists in: Laparotomy through the left rectus; if the case is favorable for resection, extension of the incision through the costal cartilages upward as far as the fifth; opening of the thorax; division of the diaphragm from the rectus incision backward through the hiatus œsophagus. The stomach and œsophagus are then dissected out and brought forward. Resection and anastomosis now follow. On closing the diaphragm, it is sutured to the œsophagus *above* the anastomosis, so that the suture line may be drained abdominally.

Where no anastomosis was possible by any of the above methods, a resection with blind closure of both ends has been done. This has invariably resulted in leakage from the upper stump.

Considerations Leading to the Adoption of My Method.—Infection from the œsophagus or the stomach, either at the time of the operation



FIG. 6.—Skin incision. The dark line is a nitrate of silver mark made the day before operation.



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or later, through leakage from sutures, has been one of the greatest dangers. The thought that this danger had to be eliminated led to the plan of taking the entire œsophagus, with exception of the well invaginated lower stump, out of the pleural cavity. Another source of infection may have come from the lungs, if they were injured at the operation, in which case the danger of pneumothorax was superadded to that of infection. This called for greater care in handling the lungs and in separating adhesions. The frequent collapse due to vagus reflex demanded more care in handling these nerves. The last two considerations led to the adoption of my thorax incision, which gives good access and permits handling the organs more gently.

Technic of the Operation.—The operation is performed in two stages. In the first stage gastrostomy by Witzel's or Kader's method is performed, and the abdominal cavity carefully examined for metastases, in the presence of which the case is not suited for resection of the œsophagus. In the second stage the œsophagus is resected. The patient lies on his right side, with his left arm up and well forward, so that the scapula is out of the way of the line of incision. A cushion is placed under the right side of the chest. An incision corresponding to the entire length of the seventh intercostal space is made through skin and muscles down to the pleura, but not through it, as it is desirable that the pleural cavity does not remain open for an unnecessarily long time and that the hemorrhage from the external wound is attended to before the pleura is opened. From the posterior end of the seventh intercostal space, between the angle and the tubercle of the rib, the incision is carried upward to the third intercostal space (Fig. 6). Skin and muscles are divided, exposing the fourth, fifth, sixth, and seventh ribs. As it is of the greatest importance to preserve the asepsis of the pleural cavity, and as the wound is so large that the possibility of infection from the surrounding parts is greater than in an ordinary wound, the wound is isolated by fastening towels to the edges of the incision with the aid of skin clasps. To insure complete hæmostasis it will be found necessary to clamp and tie many vessels. This first step of the operation may be performed under general or local anæsthesia. I prefer the latter, using a $\frac{1}{2}$ per cent. solution of novocaine with suprarenin. Then, while the vessels are being ligated, general anæsthesia is induced. As soon as the patient is under the influence of the anæsthetic the larynx is intubated for intratracheal insufflation anæsthesia. In this way the time during which the patient is under general anæsthesia is shortened.

Anæsthesia is now continued by intratracheal insufflation, and the pleura may be opened without the fear of dangerous collapse of the lung.

To divide the pleura it is desirable that a moderate degree only of intrapulmonary pressure be employed, so that the lung may collapse to an extent to recede from the knife and escape injury. Moreover, the knife must be handled with proper caution to avoid sudden entrance into the lung, as the pleura is divided. The incision of the pleura extends through the entire length of the seventh intercostal space, and an examination is made to determine the operability of the tumor. If we decide to proceed, we now complete the posterior, vertical part of the incision, which requires the division of the seventh, sixth, fifth, and fourth ribs between their angles and tubercles, the intercostal muscles, the intercostal vessels, which must be caught and tied, and the intercostal nerves.

I should like to say in this connection, that I consider the incision just described as the *normal thorax incision*, whenever plenty of room is needed. Of course it may be modified for individual purposes by

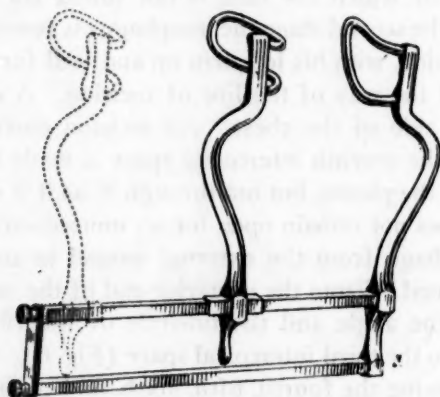


FIG. 7.—Rib spreader.

selecting another intercostal space in place of the seventh; likewise, the case may require the division of a greater or smaller number of ribs than the above-mentioned four. The incision is surely superior to extensive resection of ribs, as the integrity of the thoracic wall is preserved. In this respect it is similar to the osteoplastic resection of the skull.

A rib spreader is now placed between the seventh and eighth ribs. For spreading the ribs a number of specially constructed instruments exist. I have had much better satisfaction with an instrument that was not designed for the purpose, viz., Balfour's abdominal retractor. This consists of two parts, the main part being the spreader. I have adapted it for this purpose by remodelling it so as to spread 5 cm. farther (Fig. 7). Its full spread, 17 cm., will be required only in very large chests.

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We now have a thorough view of the whole left pleural cavity, and if at the preceding examination there still existed a doubt as to the operability of the tumor, this question is definitely settled at this time. First, we proceed to free the lung thoroughly of all adhesions. This must be done with the utmost care to prevent tearing or cutting the lung. The lung is then laid over toward the front part of the mediastinum and is kept only partially inflated. A full inflation is unnecessary and interferes with the surgeon's work. The use of lung retractors is, as a rule, not recommended. The less the organs are handled, the better. If the lung is inflated to such a degree as to render a retractor necessary, then its use is dangerous; if to the pressure within the lung a pressure from without is superadded, rupture may result, causing the dreaded post-operative pneumothorax. However, if the opposite pleura is opened in the course of operation, a more energetic inflation of the lung is required, for we cannot allow both lungs to collapse. Lung retractors are then needed.

As we stand facing the head of the patient, who is lying on his right side, we see, as prominent features in the lower part of the thoracic cavity, the aorta to our right and the pericardium to our left, the œsophagus lying between them. (It will be remembered that in this region the aorta lies behind the œsophagus and the pericardium in front of it). The œsophagus is seen only as a slight bulging of the parietal pleura to the side of the aorta. The pleura and connective tissue covering the œsophagus are now divided at some portion where it is not involved, and the œsophagus is lifted out of its bed. A tape or strip of gauze is drawn through underneath it (Fig. 8). This serves as a handle to draw the œsophagus forward or to the side, while the dissection proceeds.

The œsophagus is liberated from the surrounding structures all the way up to the upper thoracic aperture and all the way down to the diaphragm, except in cases where the tumor is situated rather high up, when the diaphragmatic end need not be liberated. To determine the extent of the dissection at the diaphragmatic end, we decide at what place below the tumor the œsophagus is to be divided, and allow about 3 cm. more for invagination of the lower stump. The dissection is best done with the aid of a blunt instrument, like Kocher's goitre sound, or a long Mayo's dissecting scissors, which is inserted between the œsophagus and the tissues lying over it. The fact that some vagus branches crossing the œsophagus must be divided in the course of this procedure need not deter the surgeon. The main vagus cords will be seen as described under Anatomical Points. Their liberation from the œsophagus is accomplished preferably, not by picking them up with forceps and dissecting

them out with scissors or knife, as one would do in the dissecting room, but by keeping close to the œsophagus and leaving the vagi in their places. An anatomical dissection of the vagi becomes necessary when they are firmly bound down to the tumor. In that case, the one that is less firmly attached is loosened; the other one may be cut. In a general

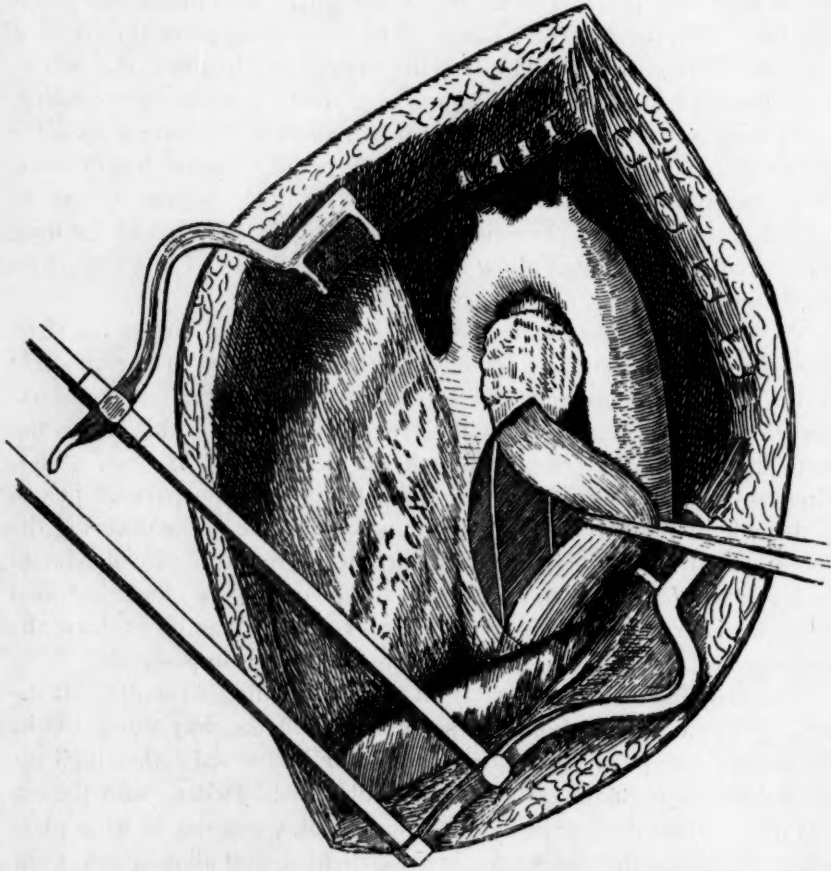


FIG. 8.—Beginning of dissection of the œsophagus. After incision of the pleura covering it the œsophagus is lifted out of its bed and held by a tape passed underneath it. The two vagi have been detached. The tumor is seen below the arch of the aorta. The lung is fairly well collapsed.

way, the less the vagi are handled, the better. Sudden and irreparable collapse has resulted from pinching them or tugging at them.

In releasing the posterior surface of the œsophagus, there is one point to which attention should be directed. After the surgeon has liberated the œsophagus in front and at the two sides, he may perhaps

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be induced to believe that, in liberating the posterior surface, caution is no longer necessary, forgetting that the right pleura is tucked in behind the œsophagus to some extent, especially in its middle portion, as pointed out above under Anatomical Points. In consequence, a tear in the right pleura may result, a rather unpleasant complication, as it necessitates an increased inflation of the lungs, owing to the collapse also of the right lung; and the increased inflation means more encroachment of the left lung on the field of operation.

The dissection of that part of the œsophagus which crosses under the arch of the aorta is not easy. It is done by blunt dissection with the finger introduced under the arch of the aorta and loosening the œsophagus from it and the left bronchus, as well as from its posterior attachments. During this part of the dissection one must be careful not to tug hard on the aorta. The right heart is already working at a disadvantage, as the partly collapsed lung offers more resistance to it than a well-inflated lung; add to this an obstruction to the function of the left heart by pressure on the aorta, constricting its lumen, and a cardiac collapse is apt soon to manifest itself. If the tumor itself is situated in the neighborhood of the aortic arch, as in my successful case, the difficulty of liberating the œsophagus becomes very great. I overcame this difficulty by ligating and dividing a number of the thoracic branches of the aorta and lifting that vessel forward. Here again, in retracting the aorta, one must be careful not to kink it, as the cardiac action will suffer in consequence. The dislodgement of the aorta is of great value in liberating the œsophagus; but in simpler cases, where the tumor did not lie near the arch, I found this procedure unnecessary. Above the arch the œsophagus is liberated, the same as below, by incision of the pleura overlying it, and a tape is again carried around it to serve as a handle for further upward dissection. When the upper thoracic aperture is reached, a finger is carried through it into the neck to the anterior border of the sternocleidomastoid muscle. Here, under its guidance, an incision is made through which the œsophagus is to be brought out afterward; for the time being, a stout silk thread is carried into the pleural cavity through this wound, one end being left outside, to serve for pulling out the œsophagus.

In my opinion, there is an advantage in making this neck incision under the guidance of a finger carried up from the thoracic cavity, even though it may appear inelegant surgery. By digging from below upward, in other words, by employing blunt dissection, less tissue is severed than in the classical mode of approach to the œsophagus, customary in the operation of external œsophagotomy, in which not only a

larger incision is needed but also very often the inferior thyroid artery must be divided to gain access to the œsophagus. In the method of dissecting bluntly from below, that artery remains uninjured, a matter of some importance, as the nutrition of the œsophagus depends in part upon the blood supply from that vessel.

Before proceeding to divide the œsophagus, the surrounding parts are well protected by gauze pads. The œsophagus is tied off with a strong silk ligature at a safe distance below the tumor, and a second

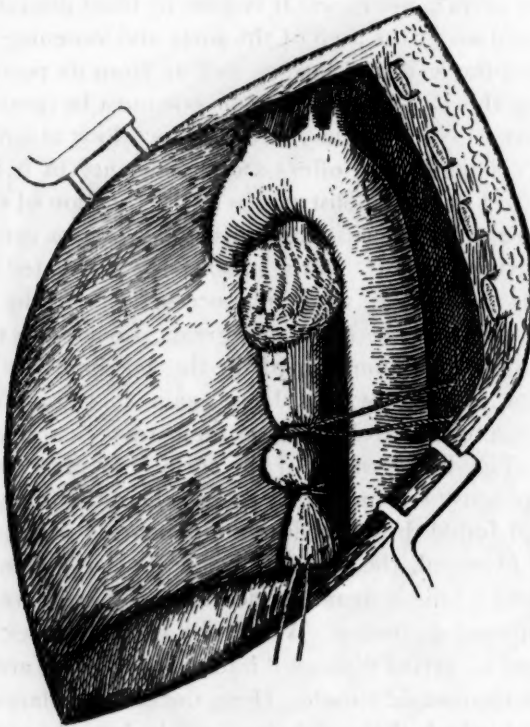


FIG. 9.—The œsophagus is doubly ligated before being cut. About 2 cm. below the lower ligation a purse-string suture is laid for subsequent invagination of the lower stump.

ligature is applied a sufficient distance below the first to enable one to cut the œsophagus between them without danger of the ligatures slipping off (Fig. 9). As the lower one of these ligatures is afterward to be invaginated into the lumen of the œsophagus, it is advisable to reduce the thickness of the end of the stump to a minimum to facilitate invagination. The site of the lower ligation is therefore thoroughly crushed before being tied. The best crushing instrument I know for the

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purpose is Payr's duodenum crusher (Fig. 10). Furthermore, a lighter ligature than the one for the upper ligation is selected. Before dividing the oesophagus, a purse-string silk suture is inserted 1 or 2 cm. below the lower ligation. If the site of the carcinoma is so low that there is not sufficient room to insert the invagination sutures beneath the site selected for ablation of the oesophagus, the stomach must be brought up into the thoracic cavity far enough to afford the necessary space for



FIG. 10.—Payr's clamp. A, closed; B, jaws open.

putting in the sutures. This is done by splitting the diaphragm and peritoneum in front of the hiatus, with careful ligation of vessels, sufficiently far forward to permit the upward dislodgement of as much stomach as necessary. The left gastric artery is divided if it interferes with drawing the stomach upward. Without dividing the diaphragm, the oesophagus may be drawn up into the thorax for 1 or 2 cm., after it has been loosened at the hiatus. Occasionally, a small portion of the cardia may be drawn up into the thorax in this manner. The oesophagus

is now divided between the two ligatures and the mucosa of the upper stump cauterized with a Paquelin cautery or with carbolic acid. If the crushing of the lower stump has been sufficiently extensive, there will be no mucosa in it; if any remain, it is trimmed off or cauterized. The lower stump is now invaginated and secured by the purse-string suture previously introduced; and, if possible, a second purse-string suture is placed to still further invaginate the stump. If the diaphragm had been divided, it is now accurately sutured. The upper stump is pushed through the channel beneath the arch of the aorta, and the ligature at its end is tied to the silk thread which had been introduced into the pleura through the neck incision. The œsophagus, with the tumor

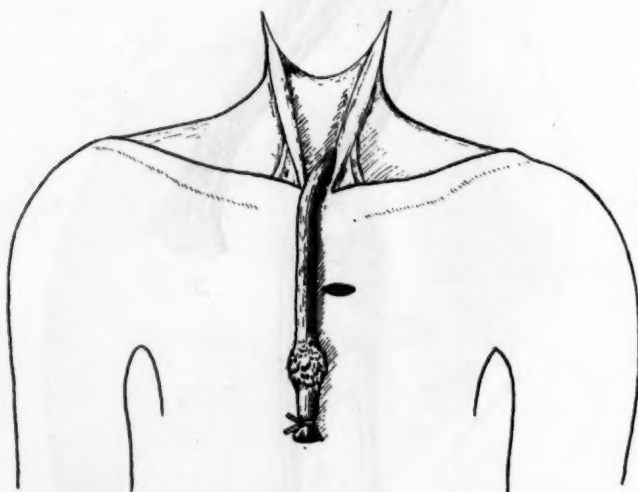


FIG. 11.—Esophagus brought out through an incision in the neck. On the chest a transverse incision is made corresponding to the place where the œsophagus is to be amputated. Between these two incisions the skin is subsequently tunnelled for the reception of the œsophagus.

attached, is now drawn out through the neck wound (Fig. 11). There it is allowed to remain, for the time being, wrapped in gauze.

We next proceed to close the chest. A few sutures of strong silk are placed to hold the seventh and eighth ribs in apposition. These sutures are carried *around* the two ribs (pericostal sutures, Fig. 12), or they may be carried *through* the ribs after punching holes in them with Friedrich's punch. No attempt is made to reunite the ends of the cut ribs; they fall in proper alignment of themselves. The muscles are united in layers by catgut sutures. Before making the suture air-tight, the lung is thoroughly inflated to bring its surface in contact with the parietal pleura. There exists in the minds of many surgeons a great fear lest

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some air be allowed to remain in the pleural cavity, as evinced by numerous articles that have been written to set forth the difficulty of completely doing away with the pneumothorax. I am convinced that a small amount of air left in the pleural cavity is entirely harmless. The experience with the production of artificial pneumothorax as a method of treating tuberculosis of the lungs has further shown that air introduced into the pleural cavity is very rapidly absorbed. Nevertheless, the effort should be made to expand the lung to its full extent. The suture of the skin completes the closure of the thoracic wound.

We now again turn our attention to the œsophagus, which, with the tumor at its end, hangs out from the neck. We hold it down over the front of the chest, estimate where it is to be amputated, and make a transverse incision through the skin at the site corresponding to this point (Fig. 11). The skin between the neck wound and the new incision on the chest is then undermined with a blunt instrument, and the œsophagus, still unopened, with the tumor attached, is drawn through

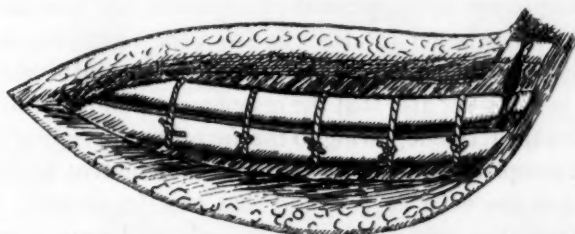


FIG. 12.—Pericostal suture holding seventh and eighth ribs together.

this tunnel and out through the new wound. The incision in the neck is closed, the tumor amputated, and the free end of the œsophagus sutured to the skin by a few interrupted stitches.

The most comfortable position for the patient after operation is partly on the right side and partly on the back. Morphine is given for a few days, and stimulants are administered according to the usual indications. Camphor, caffeine, digalen, and strophanthus are given for acute cardiac weakness. Nourishment is given through the gastrostomy tube. After the free end of the œsophagus has thoroughly healed to the skin, the upper end of the gastrostomy tube is inserted into it, when the patient wishes to take nourishment (Fig. 13). During the act of swallowing a little pressure is brought to bear on the skin at one side of the tube to prevent leakage. A fairly large tube is selected. The swallowed food passes from the œsophagus into the rubber tube and thence into the stomach.

The patient on whom I operated according to this method 20½ months ago is able to eat practically all kinds of food. She is wearing a tube, the upper or œsophageal end of which is bevelled so as to adapt itself better to the end of the œsophagus. The bevelled end is also thickened and rounded off smooth (Fig. 14). By virtue of the thickening of the rim it retains itself after introduction, and its smoothness guarantees against irritation of the œsophagus. The stomach end of the tube is bevelled in the ordinary way, and, a short distance above the end, the tube is closely hugged by a round rubber ring which indicates the distance to which the tube is inserted.

Besides this one case I have attempted the operation in two cases, both of which were unsuitable for resection. One was a woman who, in spite of her gastrostomy feeding, continued to lose weight. She died suddenly, five days after the operation, apparently from cardiac failure. The other was an alcoholic male with advanced cirrhosis of the liver, nephritis, and myocarditis. He died in the course of the night following the operation. In neither of the two cases was an autopsy permitted.

As the œsophagus lies between the two pleuræ, the question naturally arises whether it is better to attack it from the right side or from the left. An argument in favor of the right side would be that here the aorta is not in the way; also that the œsophagus stands out more prominently than on the left side, owing to the fact that the right pleura partly envelops the œsophagus, being tucked in to some extent behind it. The only obstacle is the vena azygos, and that may be divided. However, while it is true that the upper part of the œsophagus is more easily accessible on the right side than on the left, in the lower portion the liver forms a serious hindrance. This organ presses the diaphragm high up into the thorax, leaving but a very narrow space behind its dome for operating on the lower part of the œsophagus, thus greatly interfering with access to the part, possibly rendering operation entirely infeasible. One might conclude, therefore, that, if there were definite proof that the operation would be limited to the upper two-thirds of the œsophagus, the right side may be elected; but if we are uncertain how far down the affection extends, which is more frequently the case, the attack will be from the left side. Another possible objection to operating from the right side, which, however, I have not yet been able to test, may lie in the fact that the right lung is the larger of the two and that its collapse during the operation may perhaps interfere with vital functions to a greater degree than would happen in case of collapse of the left lung.

Operation for Carcinoma of the Abdominal Portion of the Œsoph-



FIG. 13.—Tube connecting lower end of cesophagus with gastrostomy opening. The two light stripes on the rubber tube in this and the following figure are remnants of adhesive plaster which was removed before taking the picture.

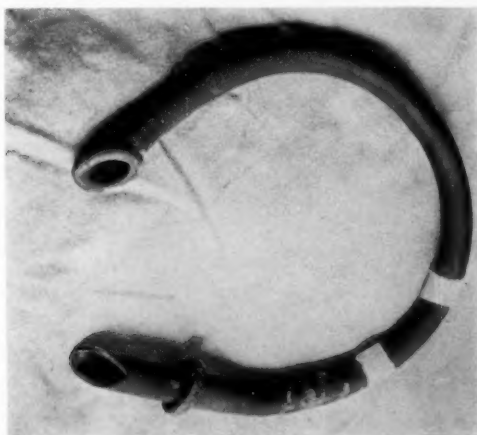
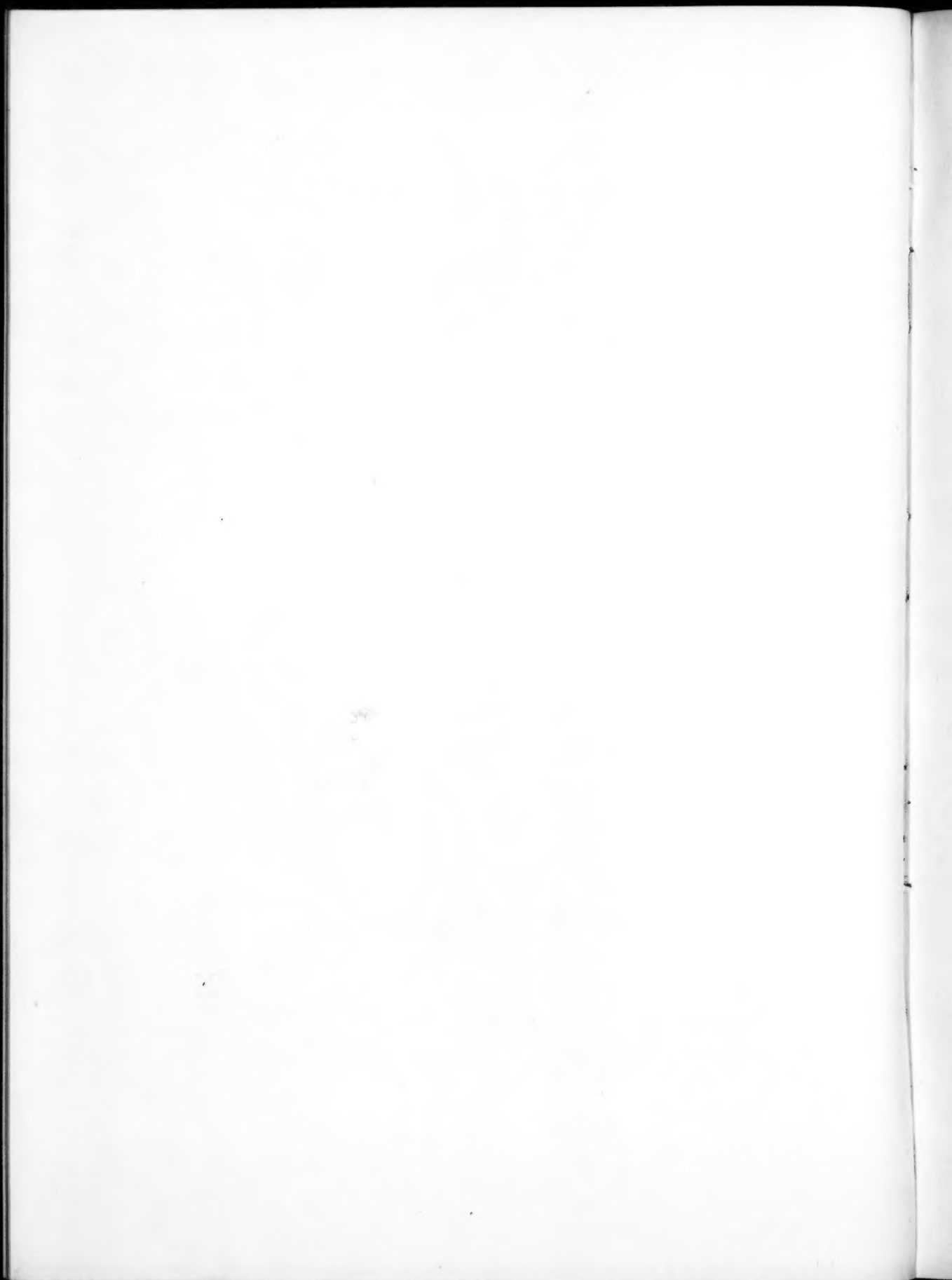


FIG. 14.—Note the bevelled and thickened upper end of the tube and the rubber ring near the lower end.



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agus.—In carcinoma of the abdominal portion, which usually also involves the cardiac end of the stomach, I recommend operating in three stages, according to a method which I worked out early in 1913 and first performed on the cadaver in April of the same year, with the assistance of Dr. Joseph King. These stages are as follows: (1) Gastrostomy. (2) Thoracotomy, as described above for carcinoma of the thoracic œsophagus. After division of the œsophagus in its lower part, the upper end is brought out at the neck, as described above, and the lower end is invaginated and placed beneath the diaphragm which is closed by suture. (3) An abdominal operation to resect the tumor. An incision is made from the ensiform cartilage along the entire length of the left costal arch, thoroughly dividing the abdominal muscles, particularly at the posterior end, so that the costal arch can be well raised. At the œsophageal hiatus of the diaphragm the peritoneum is divided and the stump of the œsophagus brought down. Then the tumor is resected, with the removal of as much of the stomach as is indicated.

A similar plan of operating could also be followed in cases of carcinoma of the thoracic œsophagus at its lowermost portion, where there is not sufficient room to amputate below the tumor.

Other Methods.—Zaaijer, already referred to, was the first to operate successfully in a case of carcinoma of the cardia by the transpleural route. In his case, although an invasion of the lower end of the œsophagus is reported, we are informed that the œsophageal bougie met the obstruction at 45 cm. from the incisors—an exceptionally long distance. He operated in three stages: (1) Gastrostomy at the pyloric portion, Kader's method. (2) Extensive rib resection in order to cause collapse of the thorax and thereby bring the lower portion of the œsophagus and cardia nearer the surface of the body, thus reducing considerably the depth at which the main operation is performed. The lowest 7 ribs of the left side are resected in almost their entire length through two parallel incisions about 25 cm. long; the superficial musculature is extirpated; the skin sutured. Zaaijer's patient had considerable dyspnoea the first 2 days following operation. Zaaijer believes this due to mediastinal fluttering caused by the great mobility of the thorax, and, in view of this experience, recommends leaving the twelfth rib intact, or at least not removing it at the same sitting. (3) Resection of the tumor by laparo-thoracotomy. The skin incision is made in the left hypochondrium about in the mammillary line; from the upper end it is carried in a curvilinear direction backward to the posterior axillary line; thence upward a little higher than the angle of the scapula. Peritoneum and pleura are opened. The diaphragm is divided from below upward

to the hiatus. Œsophagus and stomach are made movable; the lesser omentum is divided. The stomach is then divided between two clamps and the lower end sutured. The œsophagus is drawn to the skin in the neighborhood of the posterior axillary line and sutured there. The end of the œsophagus and the gastric fistula are connected by a rubber tube. According to Zaaier, this method of operation is limited to carcinoma of the cardia and of the very lowest portion of the œsophagus.

A very interesting method of operating in cases of carcinoma of the cardia has been proposed by Ach. The operation is done from the abdomen and from the neck without opening the thorax. At the anterior

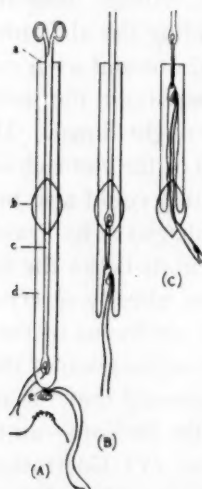


FIG. 15.—Diagram of Ach's method of extracting the normal œsophagus by invaginations, without opening the thorax. (A) *a*, mouth; *b*, incision in neck; *c*, thin steel rod introduced into *d*, œsophagus; *e*, lower end of œsophagus, tied and cut off from stomach through an abdominal incision, the ends of the ligature being left long. (B) Rod drawn up and invagination begun. (C) Œsophagus is again evaginated through neck incision by drawing on ends of ligature with which its lower end was tied. The steel rod, which is now outside the mouth, is released by cutting the string that passes through its loop.

border of the sternocleidomastoid muscle the œsophagus is exposed, and the wound is temporarily tamponed. Through an abdominal incision the peritoneal covering of the œsophagus at the hiatus is divided, and, with the finger introduced into the hiatus, the œsophagus is loosened as far as possible. A portion of the œsophagus is now drawn down into the abdomen. It is tied off with strong linen thread, about 2 cm. above the tumor, and cut below the ligature. The two ends of the ligature are left about $\frac{1}{2}$ m. long. A thin, flexible steel rod, 60 cm. in length, which terminates at its lower end in a little ring, is introduced through the mouth down to the bottom of the œsophagus. A needle armed with strong linen thread now transfixes the lower end of the œsophagus and

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the ring; the thread is drawn through, and its ends are knotted together at a distance of about 12 cm. below the oesophagus. The steel rod is now drawn up again; the thread held in its ring-shaped extremity follows and invaginates the oesophagus into itself. According to Ach, it can be drawn up without encountering much resistance. As soon as the lowest part of the cervical oesophagus is seen through the neck incision to become invaginated, the long thread with which the lower end of the oesophagus was tied is pulled out through the wound in the neck. By traction on this thread the oesophagus is again evaginated and drawn out through the neck after the staff has been released by cutting the thread that passes through its ring, in front of the patient's mouth. The procedure is shown diagrammatically in Fig. 15. The cardia is then resected and a gastrostomy done.

This, then, is a brief outline of what can be done surgically for carcinoma of the oesophagus. Though in actual results but little has been accomplished, it is a source of satisfaction to know that a beginning has been made. Whether this beginning will be followed by a series of successes depends mainly upon our ability to operate while the disease is strictly localized and the patient still in fairly good condition. It would be a mistake, at the present stage of the development of this chapter, to operate on patients who are unfavorable subjects. By such attempts, which are bound to result in failure, the operation would only be discredited and we could not hope to get patients to submit to operation while they are still in an early stage of the disease.

GASTRIC AND DUODENAL ULCER

A REVIEW OF 120 CASES OPERATED UPON AT THE ROOSEVELT HOSPITAL BY THE SURGICAL STAFF DURING THE PAST FIVE YEARS

BY CHARLES H. PECK, M.D.
OF NEW YORK

ATTENDING SURGEON TO THE ROOSEVELT HOSPITAL

THIS report consists of a review of 120 cases of non-malignant ulcer of the stomach and duodenum which have been operated upon by members of the surgical staff at the Roosevelt Hospital between January 1, 1910 and January 1, 1915. Of the 120 cases, 73.3 per cent. were duodenal, and 26.7 per cent. gastric. Of the 88 duodenal ulcers 71 were of the chronic indurated type and 17 were acute perforations. Of the 30 gastric ulcers, 17 were chronic non-perforative, and 13 acute perforations—an unusually high percentage of acute perforations for this latter group. Considering the group as a whole, 78.3 per cent. were males, 21.7 per cent. females. In the duodenal group 83 per cent. were males, and in the gastric group 70 per cent.

It was of interest to note that all of the 17 acute perforated duodenal ulcers occurred in males, the ages ranging from twenty-three to fifty-two. Of the 13 acute perforated gastric ulcers, 9 were males, and 4 females, the ages ranging from twenty-three to forty-nine.

Taking all cases together, the number occurring in each decade from twenty years to fifty was almost equal; from fifty to sixty years somewhat less, and between sixty and seventy years fewer,—but still a goodly number.

Taking up the study of the cases by groups, there were 71 cases of chronic duodenal ulcer, in all of which the condition was verified by operation, and posterior gastro-enterostomy was performed. In 44 the site of the ulcer was anterior, generally close to the pylorus; 19 were posterior, 2 multiple, 1 in the second portion of the duodenum, and in 5 the exact site was not stated.

In addition to the gastro-enterostomy, when possible, especially in the ulcers situated on the anterior surface of the duodenum, the area was infolded by Lembert sutures, thus causing some degree of pyloric occlusion. In only one of the group was typical exclusion performed; this was a case which had bled repeatedly both before and after gastro-enterostomy—the von Eiselberg unilateral exclusion being performed in March, 1911, about a year after the gastro-enterostomy. In January,

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1914, the patient was still having pain and occasional intestinal hemorrhages.

Appendectomy was done in 25 of these 71 cases; cholecystostomy for gall-stones in two cases.

In studying the symptoms presented in this group it was found that hæmatemesis occurred in 13 cases, in 10 of which intestinal hemorrhage was also present. Intestinal hemorrhage occurred in 11 additional cases—21 in all. In 30 cases it was definitely stated that no hemorrhage occurred, and in the remainder the history failed to state. Hemorrhage occurred, therefore, in about 43 per cent. of the observations, our experience coinciding with that of so many others in showing that hemorrhage occurs in less than 50 per cent. of the cases.

Pain of a characteristic type, occurring from two to four hours after meals, relieved by food or alkalines, was noted in 24 cases—less than 50 per cent. of the cases in which the character of the pain was recorded. In 26 additional cases, pain, while present, was irregular in occurrence, bore no relation to the taking of food, or occurred within a short time after meals, *i.e.*, in more than 50 per cent. of the records, the pain was atypical rather than of the classic type attributed to chronic duodenal ulcer. Pain of some sort, however, was a constant symptom.

Vomiting at some time during the illness occurred in about half of the cases; but relatively few had persistent or frequent vomiting.

Records of gastric analysis in 40 of the cases showed free hydrochloric acid below 40 in 20 cases (50 per cent.), between 40 and 60 in 13 cases, and above 60 in 7 cases. The total acidity corresponded fairly well to the percentage of free acid, six of the cases showing a total acidity above 90. In no case was absence of free HCl noted.

Observation of the red cell count was made on 30 of the cases, with the following results: Above 6,000,000, 4 cases; between 5,000,000 and 6,000,000, 8 cases; a total of 12 cases, or 40 per cent., with some degree of polycythæmia. Eighteen cases (60 per cent.) had a count of 5,000,000, or less. In estimating the value of polycythæmia as a diagnostic sign in chronic duodenal ulcer, one must of course allow for secondary anæmia due to repeated hemorrhage, but even considering this, our observation on this series would seem to indicate that this sign is of only limited diagnostic value.

Of the 71 cases 65 recovered and 6 died—a mortality of 8.4 per cent. This relatively high mortality is partly due to the fact that several of the cases were very poor operative risks on account of age, extreme cachexia and alcoholism. Only three of the deaths seemed

the direct result of the gastro-enterostomy *per se*, and one of these was a man of advanced years who was much depleted by repeated intestinal hemorrhages. The causes of death in detail were as follows:

CASE I (No. B3332).—Embolic pneumonia and pulmonary abscess, with death on the nineteenth day after operation, in a man sixty-four years of age.

CASE II (B4135).—Acute gastric dilatation, persistent vomiting; died on the sixth day after operation following a secondary operation performed on the fifth day.

CASE III (B4644).—Post-operative shock and exhaustion eight hours after operation. Supposed ulcer in second portion of duodenum; diagnosis never fully proven. Marked cachexia, which was perhaps due to some undiscovered cause. No autopsy.

CASE IV (A6001).—Persistent vomiting; entero-enterostomy on the fourth day; death on the fifth day after primary operation.

CASE V (A3077).—An alcoholic man thirty-eight years of age; bronchopneumonia; death on the fourth day.

CASE VI (B3380).—A very anæmic, cachectic man, forty-four years of age, with large, multiple ulcers of the duodenum and a complicating megacolon; operated upon under diagnosis of malignant disease of colon; massive induration about ulcers thought to be neoplasm, but not proven at autopsy. Wound broke open on seventh day; death on ninth day.

In estimating the late results, we have had some difficulty in following hospital cases satisfactorily, and our efforts in this group have not covered a sufficient period of time to be complete. Definite late reports have been obtained in 36 cases, in all but 4 of which the late results have been most satisfactory. One of these, already referred to, still has pain and hemorrhage,—the case in which secondary pyloric exclusion was performed; another made a slow convalescence, but finally a satisfactory one, after secondary entero-anastomosis for recurring vomiting. Two others are much improved, but still have pain and indigestion at times. Two of the 32 cases were traced a few months only, when one returned home to Italy and one to Russia.

Many of these cases have been followed from two to four years and their restoration to comfort and health, often after years of suffering from the effects of the ulcer, has been most striking and satisfactory. Efforts are being made to follow others of the group, but many are hopelessly lost through change of address, in the poorer sections of the city. For the past two years an improved system of following up cases after discharge from the hospital has enabled us to keep better track of the late results.

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Chronic Gastric Ulcer.—The 19 cases of chronic gastric ulcer in the series, gave less satisfactory results than the duodenal. Gastro-enterostomy was performed in 12 of the cases; partial gastrectomy in 3; excision of the ulcer without gastro-enterostomy in 2; cautery puncture with gastro-enterostomy in 1, and exploratory coeliotomy in 1 case. There were 3 deaths in the series, and a fourth case returned to the hospital shortly after discharge with pneumonia, from which he died.

Twelve of the ulcers were on the lesser curvature at some distance from the pylorus; 2 were on the posterior wall; 4 were pyloric, and in 1 the position was not stated.

Hæmatemesis had occurred in 10 cases; was absent in 7, and not mentioned in 3.

Pain was a constant symptom, generally made worse by the ingestion of food; relieved by vomiting. It varied in intensity, but there were seldom free intervals lasting days or weeks, as is so often the case in duodenal ulcer. Pain was generally more constant and severe than the pain of duodenal ulcer.

Gastric analysis in 12 of the cases showed free HCl 40 or below, in 8 cases; 60 in 2 cases, and absent in 2 cases.

These findings again emphasize the fact that the results of gastric analysis are of only limited diagnostic value.

Our series of gastric ulcers is quite too small to establish rules of management for the different types; but, in general, I believe that ulcers near the pylorus, especially those associated with a good deal of induration, and which it is difficult to differentiate, clinically, from carcinoma, should be excised—*i.e.*, pylorotomy or partial gastrectomy should be performed. When situated on the lesser curvature near its middle, or at the cardiac end, one may consider: (1) Excision (V-resection with suture) with or without gastro-enterostomy; (2) cautery puncture of the ulcer, as suggested by Balfour, with closure of the hole by suture, with or without gastro-enterostomy; (3) gastro-enterostomy alone, without direct attack on the ulcer.

In our series 2 cases were treated by V-excision without gastro-enterostomy; one has made a perfect recovery, is well two years after the operation, and has gained twenty pounds; the other has had persistent pain and indigestion, was readmitted three years after the primary operation, but refused the secondary operation which was advised.

One recent case of penetrating indurated ulcer high on the lesser curvature was treated by cautery puncture (Balfour) with gastro-enterostomy: The cautery point was plunged through the centre of the

ulcer, and by burning around the edges of the opening the entire ulcer was practically ablated; the opening left in the gastric wall was closed by suture, reinforced by a tier of Lembert sutures, and, finally, by the fatty tissue from the lesser omentum. The procedure is simple, quick, and I was much impressed with it as a means of dealing with high lesser curvature ulcers where V-excision is so difficult. Even if one does not succeed in cauterizing out all of the ulcer, the reparative process thus excited should greatly hasten its healing. The patient was quite free from symptoms when last seen.

I believe it is wise to do gastro-enterostomy in every case whether cautery puncture, V-excision, or any direct treatment of the ulcer is used; for it is quite possible that the chemical change in the gastric juice and contents, as pointed out by Patterson, has at least some influence favoring healing of the ulcer. One case of ulcer, quite close to the cardia, in which exploratory cœliotomy only was done one year ago, has continued to have pain and indigestion, and I have regretted that gastro-enterostomy was not done in this case. I was not at the time familiar with the method of cautery puncture, and was under the impression that gastro-enterostomy was practically useless in ulcers near the cardia.

Of the 3 cases treated by partial gastrectomy, 2 recovered, and 1 died of shock—a difficult case, with the ulcer situated far up on the lesser curvature. Both of the cases which recovered are quite well and free from gastric symptoms two years six months, and two years nine months after operation, respectively.

Of the 12 cases in which gastro-enterostomy alone was performed, there were 3 deaths: 1 from persistent vomiting which secondary operation failed to relieve; 1 from pneumonia with pulmonary embolus on the eighth day. The third fatal case left the hospital well from his operation, but returned in a few days ill from pneumonia, from which he died.

Of the 9 cases which recovered, 3 are known to be free from gastric symptoms at twenty-one months, fourteen months, and four months, after operation. Two continue to have pain and indigestion at twelve months and eighteen months after operation. Four of the earlier cases we have been unable to trace. The number of cases in this group is too small and the end results too imperfectly traced to draw conclusions of much value, but it is quite evident that the results of gastro-enterostomy for gastric ulcer, without excision of the ulcer, are much less satisfactory than in duodenal ulcer. We have had no late development of carcinoma in a gastric ulcer as far as we know, though

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it is quite possible that it may have occurred in some of the untraced cases. It is also possible that it may have been present in the case which returned (B1479), two years and nine months after V-excision, with persistent symptoms and marked cachexia, and who refused to remain in the hospital for further investigation or operation.

Perforated Duodenal Ulcer.—Of the 17 cases of acute perforated duodenal ulcer, 2 died before leaving the hospital, 1 of pneumonia on the seventeenth day after operation, and 1 after a secondary operation for subphrenic abscess twenty-two days after primary operation. Two others died shortly after leaving the hospital, 1 of pulmonary tuberculosis lighted up by the illness and operation, and 1 a few days after discharge, of hemorrhage from an ulcer situated on the inferior wall against the head of the pancreas. In this latter case, the primary operation showed a large, localized abscess in the upper abdomen containing gas, the site of the perforation was not located, and any attempt at closure was impossible.

No case died of extension of the peritonitis. In 4 of the cases simple closure of the ulcer without gastro-enterostomy was employed, with 1 death; in 1, drainage of a large localized abscess, without suture (the fatal case just cited). In 12, posterior gastro-enterostomy was done in addition to closure of the perforation, with 11 recoveries and 1 death (pneumonia on the seventeenth day). While the series is too short to be conclusive, gastro-enterostomy does not seem to have had an unfavorable influence on the mortality.

As to the time which had elapsed between symptoms of perforation and operation—of the fatal cases 1 had had symptoms for three days, with moderate leakage (death from pneumonia); 1 for five hours (death from subphrenic abscess). Of the 15 cases which recovered from the operation 9 were operated upon within twelve hours; 4 in twelve, twenty-seven, thirty-one and forty-eight hours, respectively; and in 2 the history indicated perforation several days before, with partial sealing by adhesions and fresh leakage a few hours before operation.

Of the 17 cases, 10 were closed without drainage, and 7 were drained. One of the fatal cases was drained, the other was not.

One can conclude from this study that cases of acute perforated duodenal ulcer, if operated upon promptly, should rarely die of peritonitis; that drainage can safely be omitted in the average case, but should be used if the closure of the perforation is insecure, or if a walled-off abscess has formed, making further pus formation probable;

that gastro-enterostomy should not increase the mortality, if used in properly selected cases.

Opinions are divided as to the wisdom of performing gastro-enterostomy in the presence of acute perforation, but it seems rational to suppose that a permanent cure of the ulcer would be aided thereby, though undoubtedly many undergo spontaneous healing after perforation and simple suture, and remain well.

The extent of the peritonitis present at the time of operation varied from a moderate amount of fluid in the upper abdomen, to a generalized process involving both flanks of the pelvis. Drainage of the pelvis or flanks was resorted to in 1 case only.

Of 6 cases which we have been able to trace, 4, in all of which gastro-enterostomy was performed, are perfectly well at four years, three years, two and one-quarter years, and two years, respectively. One remained well and free from gastric symptoms for over three years, but for the last year has again complained of occasional pain and indigestion. One case, operated upon two years ago without gastro-enterostomy, suffers from pain and indigestion, constantly. Seven cases we have been unable to trace as yet for late results, though all were known to be well for a considerable time after leaving the hospital.

Perforated Gastric Ulcer.—Of the 13 cases of perforated gastric ulcer, 7 recovered and 6 died. The 6 fatal cases all died of peritonitis, 1 having pneumonia, 1 subphrenic abscess and pleurisy, and 1 delirium tremens, in addition to the peritonitis. Four of the 6 were late operations from one to five days after perforation, with peritonitis already well-developed. The other 2 were operated upon twelve and thirteen hours, respectively, after perforation. Both had extensive leakage and peritonitis. Gastro-enterostomy was not performed in any of the fatal cases, but was done in addition to closure of the ulcer by suture in 5 of the 7 cases which recovered. In 5 of the 13 cases the perforation was prepyloric; in 5 on the lesser curvature at some distance from the pylorus; in 3 (two of which were advanced cases of peritonitis, and fatal) the site of the perforation was not accurately located, though it was believed to be gastric.

Of the 7 cases which recovered, 3 were operated upon about six hours, and 1, twelve hours after perforation; in 2 there were well-localized epigastric abscesses; and in 1, the perforation was partly sealed by adhesions.

For the prepyloric group of perforations, indications for gastro-enterostomy at the time of the primary operation would seem to be the

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same as in duodenal ulcer; *i.e.*, when the patient is in good condition and future pyloric obstruction probable, gastro-enterostomy may be performed.

In perforation on the lesser curvature or anterior wall, the need of it is less evident, and simple closure by suture is usually sufficient. It is better to leave the gastro-enterostomy for a future time than to do it under conditions which greatly increase the immediate operative risk.

It is frequently stated that symptoms of acute perforation often come out of a clear sky without previous symptoms of gastric trouble: of the 17 cases of duodenal perforation, all but 2 gave a history of previous indigestion, though in 4 of these the history was a short one of from one to two weeks. In the gastric group practically all of the cases had had previous ulcer symptoms.

Radiographic findings are becoming of more and more aid in the diagnosis of chronic ulcers, both gastric and duodenal. In gastric ulcers, especially, positive evidence is often obtained in cases where other signs and symptoms are very doubtful. Our records are too incomplete to attempt to tabulate the findings in this series, but it is enough to say that all suspected cases are now examined in this way as a routine, and not only in many cases is the diagnosis definitely established, but negative explorations are less frequently done than was the case before this valuable aid in diagnosis was available.

In conclusion, I wish to thank my colleagues on the Surgical Staff of the Hospital for permission to include their cases in this report.

ON RETROPERITONEAL PERFORATION OF DUODENAL ULCER

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THE majority (90-95 per cent.) of duodenal ulcers are situated in the first part of the duodenum, *pars horizontalis superior*, and most frequently near the pylorus. If such an ulcer perforates, the usual result is peritonitis. A small number of duodenal ulcers are situated further down in the duodenum, in its *pars verticalis* or (even more rarely) in its *pars horizontalis inferior*. If an ulcer in these parts occurs on the back wall, not covered by the peritoneum, and perforates, the perforation leads to inflammation in the retroperitoneal tissue. The retroperitoneal phlegmon or abscess as a complication to duodenal ulcer is rare, it is true, and it has therefore been extremely scantily treated both in the text-books and in monographs; but, nevertheless, it deserves, in my opinion, to receive more attention than has so far been accorded to it. As I have had the opportunity to operate one case of retroperitoneal abscess (Case I), where, it is true, the source was not placed beyond doubt by post-mortem examination, because the patient recovered, but which was unquestionably a perforated duodenal ulcer, it seems to me justifiable to communicate the case, and expedient in connection therewith to adduce cases bearing on the matter from the literature of the subject, in order to direct attention to this sometimes neglected complication of duodenal ulcer and to make a contribution to the common stock of knowledge on the subject.

CASE I.—B. J. B., male, sixty-three years old, tended at Trälleborg Hospital, February 14 to March 13, 1912.

Anamnesis.—Ever since the age of fifteen to twenty the patient had had "pains in the belly" in the form of periodically recurring stomachic troubles; sometimes felt free of symptoms for a couple of months at a time, but afterwards for some days or weeks had "heart-burn," eructations, felt discomfort in the pit of the stomach after fat food or coffee, and sometimes had vomitings; the pain had usually come one to two hours after a meal, vomitings often not till two or three hours after; and he had mostly had to follow a more or less strict diet. At the age of forty-five he had, during 4-5 days, repeated vomitings of blood, and after that tar-colored evacuations for a day or two more: he was on that occasion very poorly and kept his bed for three or four weeks. The patient did

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not begin to take spirituous liquors till about the age of forty-five; but after the age of forty-five to fifty he took them in greater quantity and during the last few years, at least periodically, in excess. During the last six months the patient had had serious stomachic troubles and often vomitings; and during the last few months he had sometimes even been confined to his bed. About three weeks ago he became worse and had increasing pain in the right side of the abdomen and as early as two weeks ago he was so bad that he could scarcely stand (at that time he declined to take the hospital nursing which was then proposed for him). He had stayed in bed at home during these two weeks with fever (generally between 100° and 102°), without appetite, occasional vomitings, difficult evacuation, severe pains in the right side of the abdomen, shiverings once or twice during the last week and a general state of weakness. No urinary troubles: the urine had on repeated examinations contained albumen. The doctor in charge of the case could discover no symptoms of appendicitis, nor of peritonitis, or even of peritoneal irritation; but during the last part of the fortnight he was able to feel, at about the site of the right kidney, a painful resistance, which increased downward and became more and more distinct. The patient entered the Trällebörg Hospital on February 14, 1912.

Condition February 14, 1912: Considerably affected; feels weak and poorly. Though still fairly fleshy, yet looks in low condition. Temperature 102° ; pulse 110-120. Urine contains albumen to a small amount; the sediment only a few leucocytes. No appetite at all; occasional vomitings, obstipation and difficult passing of gas. The abdomen is not dilated: its left-hand and upper portion, and also the medial part of the right side of the abdomen, are soft and callous. At a considerable distance laterally on the right side of the abdomen a resistance can be palpated, that evidently lies deep, is indistinctly limited upward and laterally, but is distinctly limited medially and downward, the size of two fists, and tender to deep palpation: this extends from the site of the lower half of the right kidney downward to the right fossa iliaca, with its lower pole about two or three finger-breadths below spina iliaca ant. sup.

Operation (February 14, 1912) (by the present writer).—Under a local anæsthetic an extraperitoneal incision, 8-9 cm. long, is made above spina iliaca ant. sup., in a downward and medial direction, through the musculature of the abdominal wall, and more than a tumblerful of distinctly thick pus is emptied from an abscess cavity, manifestly retroperitoneal, well defined downward and forward. The course of recovery was regular, with a temperature after four days of 100.5° ; copious secretion of pus during the first week or two, afterwards a smaller secretion and a

good cure. The patient's general condition improved but slowly during the first two or three weeks: he had no appetite, found it difficult to take food, and occasionally vomited. Began to dress and lie on the couch after three weeks and went home on March 13, almost wholly healed and free of albumen in the urine and in rapid convalescence. After his return home the improvement continued steadily: during the first six months he put on about 10 kg. in weight. According to information received in February, 1914, he has felt pretty well since the operation, though he has now and again had his old stomachic troubles—"heart-burn," belching, discomfort and occasionally vomiting, usually two hours after a meal.

In this case both the stomachic symptoms mentioned in the anamnesis as occurring periodically ever since the years of adolescence in the form of pains, one, two or three hours after meals, and also the appearance eighteen years ago of copious bleeding in form of hæmatemesis and tar-colored evacuations, indicate that the man had suffered from duodenal ulcer; and as late as January, 1912—to judge by the increased and more than usually severe stomachic symptoms during the last preceding months—he certainly had an open and unhealed ulcer. The history of the case further shows that at the end of January, 1912—that is to say, three weeks before he was admitted to the hospital and underwent the operation—he became worse, had pains in the right side of the abdomen, and then kept his bed with his general health clearly affected by fever and later by shiverings, loss of appetite, occasional vomitings, decrease of strength, and was steadily growing worse, while a deep situated tender resistance developed in the neighborhood of the site of the right kidney and gradually spread downward. At the operation the resistance proved to be a retroperitoneal abscess cavity, with well-defined limits downward and forward; in an upward direction, on the other hand, a finger introduced into the cavity could feel no boundary. The abscess was drained and healed without any complications in a few weeks. The question now is: whence comes the retroperitoneal abscess in this case? The first and most obvious possibility is that it may be a circumscribed appendicular abscess. The objections to this view are that during the first week of the illness the patient exhibited no objective symptoms pointing to acute appendicitis, and that from the time he felt ill he never had any symptoms whatever of peritoneal irritation, although, if it had been a case of acute appendicitis, this would have been the first attack. Moreover, the resistance in the right lumbar region was palpated, on its first appearance, high up in the site of the right kidney, and developed downward, and as regards

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shape the resistance was evidently well defined downward and forward, and in the palpatory investigation behaved most like a tuberculous abscess which was in process of sinking into the fossa iliaca. On the strength of the anamnesis and what was ascertained by palpation and at the operation, acute appendicitis would seem, with a very high degree of probability, to be excluded as a possible cause of this suppuration. My first tentative diagnosis at the examination of the patient in his home was paranephritic abscess with the right kidney as the probable starting-point: he had at that time albumen in the urine. But the patient had never before, nor during the two years since the operation, had any symptoms pointing to any of the kidney diseases that are usually complicated by paranephritic abscesses; in fact, he has never had any symptoms whatever from the urinary organs. Moreover, while further examination showed indeed that the urine contained a small amount of albumen, it also proved to have no other pathological constituents whatever, and even the albumen disappeared entirely one or two weeks after the operation: under which circumstances the most obvious explanation is that the albuminous urine was of a usually transitory character, connected with his septic general condition. Neither in the anamnesis nor in the status of the patient just before the operation, nor in the after-history of the case, is there any support for the supposition that the retroperitoneal abscess came from the right kidney. Neither is there the slightest reason to believe that the pancreas, the liver or the bile-ducts were in this case the starting-point of the suppuration; such cases have recently been described by Sprengel¹ and others. Almost the only possible starting-point that remains, therefore, is the duodenum. If one puts together such facts, as that the patient undoubtedly had duodenal ulcer and, during the last part of the time, aggravated ulcer-symptoms which, as experience teaches us, is often the case during the time immediately preceding a perforation—it seems to me not only highly probable, but even tolerably certain, that the retroperitoneal abscess in this case was due to perforation of an ulcer in the back wall of the duodenum. In further support of this diagnosis may be adduced the great measure of agreement (as regards symptoms and course of development) between the case in question and Case V below, previously published by the present writer—where the diagnosis, “perforated duodenal ulcer,” was confirmed by section.

Acute retroperitoneal perforation of a duodenal ulcer, with the resultant extensive suppuration in the retroperitoneal tissue, is undoubt-

¹ Sprengel: *Klinische Beiträge zu den diffusen entzündlichen Erkrankungen des Retroperitoneums*. *Archiv f. klin. Chir.*, bd. 100, s. 382.

edly a rare complication of duodenal ulcer. In the literature of the subject, I have found no more than five certain cases that have been fairly fully described,² all these cases—the history of which is given below—have been such as have come to section, that is, the diagnoses have been diagnoses confirmed by autopsy. In the literature accessible to me I have not come across a single case of this kind that has ended in recovery. This, in my belief, is not due to the fact that such cases have not occurred, but to the fact that they have not been diagnosed or at least have been regarded as so obscure in diagnosis that they have not been published. Every surgeon who has had any considerable number of abdominal cases certainly knows some rare cases resembling that just described—acute retroperitoneal abscesses, of obscure origin, on the right-hand side—which after operation have resulted in restoration to health. In a number of these cases it is my firm belief that the source of infection is a duodenal ulcer. I am, therefore, also convinced that retroperitoneal phlegmon or abscess is neither such an extremely rare form of duodenal ulcer complication nor, in respect of prognosis, so hopeless as the material collected here would lead one to surmise.

The duodenal ulcers which, on perforation, give rise to retroperitoneal suppurations are most frequently on the back wall of the pars verticalis duodeni; but they may also be situated in the pars horizontalis inferior, as, for instance, in a case observed by Warfvinge and Wallis,³ where the somewhat subacute perforation that occurred led both to the appearance of a small and limited retroperitoneal abscess and also to a direct breaking into the vena mesenterica superior with consequent thrombus in the vena porta and suppurative hepatitis.

Acute retroperitoneal perforation leads to an inflammatory process in the retroperitoneal tissue which in different cases may behave differently and pass to different quarters.⁴ Thus, as in the case described

² This collection, therefore, does not include those cases where the diagnosis is not fully clear, indeed, but where the histories of the sicknesses make it seem more probable that they have from the beginning been cases of intraperitoneal perforation with circumscribed abscess, as in the majority of cases of exterior duodenal fistula. Such cases have been collected by Collin, *Etude sur l'ulcère simple du duodenum* (Thèse, Paris, 1894, pp. 17-20); Moynihan, *Duodenal Ulcer* (London, 1910, pp. 194-204); Melchior, *Das Ulcus Duodeni* (*Ergebnisse der Chirurgie und Orthopädie*, bd. 2, 1911, s. 247).

³ Wallis: *The fall av suppurativ hepatitis* (Three Cases of Suppurative Hepatitis). *Hygiea*, bd. 46, 1884, p. 333.

⁴ The spread of infection into the retroperitoneal tissue after subcutaneous retroperitoneal duodenal rupture is described in a work by Schumacher—Zur *Duodenum*. *Chirurgie* (Bruns Beiträge z. klin. Chir., bd. 1, 1911, pp. 498-500).

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above and also in Cases V and VI below, the perforation may lead to the appearance of abscess limited on the right side in the kidney region, which advances behind the colon ascendens down to the right-hand fossa iliaca, somewhat in the manner of a sinking abscess. In Case IV an abscess developed in a similar fashion has penetrated still further, even down to the ligamentum Pouparti, spontaneously perforated the skin just above the inner part thereof, and given rise to a permanent fistula, through which a gall-colored fluid with remains of food was drawn off—showing it to be a duodenal fistula. In Case VI, too, there arose a duodenal fistula—in this instance after incision into the retroperitoneal abscess. The perforation may further lead to a somewhat diffused phlegmonous process in the retroperitoneum, as in Case III, where it spread retroperitoneally even to the left side and down into the pelvis. The infection may also spread, as in Case II, from the retroperitoneum along the large vessels up through the diaphragm into the mediastinum—in this particular case in the form of a gaseous phlegmon.

Retroperitoneal perforation appears in some cases suddenly with quite violent symptoms (though not so violent as perforation in the abdominal cavity): rapidly recurring and severe pains in the upper or the right part of the abdomen, vomitings, and disturbance in the general condition of the patient. In other cases the perforation makes its appearance with less marked symptoms, and retroperitoneal inflammatory process may develop, at least in the beginning, quite stealthily and even relatively slowly: only after a week or two with indefinite local symptoms such as fever, with possible shiverings, heightened pulse, diminution of appetite and strength. In such cases the diagnosis will be clear when the tenderness increases or a palpable resistance appears, for instance, at the site of the right kidney or in the right fossa iliaca. For this reason, too, it was not until three to five weeks after the perforation that the retroperitoneal abscess was incised in Cases I, III and V. And in Case IV the process developed still more slowly, and after spontaneous perforation gave rise to a duodenal fistula, with which the patient lived 5½ months.

As regards treatment, an early incision of the retroperitoneal phlegmon or abscess is, of course, greatly to be desired. In many cases, especially those with only a small perforation-opening on the duodenal wall and definite limits of the suppuration, a good result would appear to be attainable with no intervention beyond retroperitoneal incision with drainage, as, for example, in Case I; Case V also would perhaps have progressed just as favorably, after incision and drainage, if fatal pneumonia had not supervened. Should there arise—spontaneously or after

incision—a duodenal fistula, the best thing would appear to be to begin with waiting and to hope for spontaneous healing, as in the case of stomachic fistula after incision of a circumscribed intraperitoneal perforating abscess or a stercoral fistula after an operation for acute appendicitis. If, on the other hand, a duodenal fistula shows no signs of healing, but allows the contents of the bowels to pass through by any considerable extent, so that the patient's nutrition begins to suffer, as in Case IV, laparotomy should be performed before the patient loses his strength too much; and in such cases, as Berg⁸ proposed more than ten years ago, the procedure which with the least risks affords the best prospect of the fistula's healing and of a favorable result is gastroenterostomy with pyloric exclusion. To complicate the laparotomy by a transperitoneal incision laterally round the edge of the duodenum into the retroperitoneal tissue with a view to the direct suture of the perforation-opening on the bowel—as Telford and Radley recommend and in one case (Case VI) actually did with unfortunate results—would not seem to be advisable as a first measure and only very rarely necessary.

CASE II (FÖRSTER,⁹ published in 1861).—Male, aged nineteen, powerful individual, previously in good health. Had long suffered from pains and strain in the stomach region one to two hours after a meal. Suddenly showed symptoms of general acute peritonitis, of which he died a few days later. The autopsy showed the abdominal cavity to contain much gas, exudations and contents of the bowels. In the front wall of the duodenum near the pylorus there was a perforated ulcer. Exactly opposite this, on the back wall of the duodenum, there was likewise a perforated ulcer, which led into an abscess-cavity in the retroperitoneal tissue; the abscess continued in the form of a gaseous phlegmon upward along the great vessels as far as the neck, where the skin was discolored and the cuticular tissue emphysematous.

CASE III (PERRY and SHAW¹⁰).—G. D., male, aged thirty-two. Five weeks before admission he was seized with sudden severe abdominal pain and vomiting, three days after which he had an attack of pleurisy on the right side. On admission fever; painful swelling of the abdomen; the abdominal wall was stretched, and there was marked fulness in the flanks; no ascites could be made out. When he had been in the hospital for four days, an incision was made in the right iliac region, and eight ounces of pus evacuated. Ten days later a second abscess was opened above the left groin. Eventually two more incisions were made,

⁸ A. A. Berg: Einseitige Ausschaltung der Duodenum bei perforierender Geschwürbildung an der hinteren Wand des absteigenden Duodenalastes. *Zentralbl. f. Chir.*, 1903, p. 556.

⁹ Cited from Kraus, *Das perforierende Geschwür in Duodenum*. Berlin, 1865, p. 33.

¹⁰ Perry and Shaw: *On Diseases of the Duodenum*. Guy's Hospital Reports, vol. 50, 1894, p. 270 (case 211).

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one in each loin, and from all four openings pus continued to drain until his death, six months after the onset of his illness. At the autopsy, the abdominal viscera were found to be firmly matted together by old adhesions, and there were several collections of pus in the pelvis behind the peritoneum. In the duodenum immediately below the pylorus there was, upon the posterior wall, a thick-edged perforating ulcer half an inch in diameter.

CASE IV (WAGNER^{*}).—Male, aged forty-five. In the autumn of 1898 he began to have continual pains under the right costal margin and occasional vomiting. In February, 1900, there could be observed in the right inguinal region a rounded resistance, which, however, later disappeared to such an extent that he could work from April throughout the summer. In October there again appeared at the same spot a similar resistance, which grew and spontaneously perforated the skin on October 17, giving out a copious supply of stinking brownish-red liquid. After this the fistula remained open and secreted a like liquid. On one occasion he had observed that one hour after eating some grapes the seeds came out through the fistula. He entered the hospital at Hanau, February 14, 1901. Status at reception: had become very thin; abdomen soft and insensitive; no fever; nothing abnormal from the urine; no resistance in the right fossa iliaca; close above the inner half of ligamentum Pouparti there was a large fistula opening, the size of a sixpence piece, from which was secreted bile-colored liquid with small food remains. The patient refused the operation proposed, grew weaker, and died of inanition on April 1. The autopsy revealed on the posterior wall of the pars descendens duodeni a round hole of the size of a small lentil, but no other ulcerations in the stomach or duodenum. A flexible sound inserted through the duodenal perforation went through a narrow, fairly straight passage along the lumbar vertebral column retroperitoneally down to the fistula opening.

CASE V (EURÉN^{*}).—A. A., female, aged twenty-two; inmate of Jönköpings Hospital August 7 to August 16, 1908. Had suffered from pleurisy three years earlier; but had since been well. Three weeks previously the patient began to feel gripes and strains in the stomach, chiefly after a meal; bad appetite, obstipation and now and then shiverings. Was admitted to a cottage hospital on August 1 and there kept for a week: during this period had an irregular temperature between 100.8° and 103.6°, indefinite local symptoms, but increasing tenderness was observed somewhere above the lower part of the right kidney; during the last few days occasional vomitings; on the last day a distinct resistance in the right side of the abdomen (appendicitis with retroperitoneal abscess?). The patient was moved to Jönköpings Hospital on August 7; on her arrival she had a temperature of 103.8° and a pulse of 120. Condition on August 8: temperature 99.3°; pulse 100. On the right side of the abdomen, below the costal margin, a pretty large tender resistance could be perceived, which on the inflation of the colon was found to lie behind this. Condition on August 11: during these four days there was a gradually increasing temperature reaching 102.4° in this evening, with pulse at 110 (probable diagnosis: paranephritic abscess).

^{*}Wagner: Ein Fall von Duodenalgeschwür mit retroperitonealem Durchbruch. Munch. med. Wochenschr., 1901, p. 1388.

^{*}Petren: Ueber Perforation von Magen- und Duodenalgeschwüren. Beiträge zur klin. Chir., bd. 72, 1911, p. 453 (Case 99).

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Operation, August 12 (DR. EURÉN).—Laparotomy incision above the gall-bladder, which is found to be in good condition; the abdominal cavity is free; the resistance is extraperitoneal. Incision is made above the outer part of the ligamentum Pouparti; a way is made paraperitoneally to the resistance, the position of which corresponds to the right kidney; a cavity with thick yellowish-green pus is emptied, flushed and drained; the kidney is not palpable. Course of illness: temperature for three days about 101° and pulse about 130; on August 15 symptoms of pneumonia on the right side; death took place on the 16th. The autopsy showed that the abscess originated in a perforated duodenal ulcer on the part not covered with peritoneum, and developed retroperitoneally.

CASE VI (TELFORD and RADLEY¹⁰).—L. J., male, aged forty-three, was admitted to the Manchester Royal Infirmary on February 3, 1912. He gave a history of many years of "indigestion," and had been acutely ill for ten days. His illness began with severe pain in the upper half of the abdomen, and was followed by vomiting. The pain and vomiting had continued without remission since the attack. He was a spare man of good facies. His temperature was 100° and pulse 120. There was a large and obviously inflammatory mass in the right iliac fossa, extending for some distance upwards into the loin. The rest of the abdomen was flat and loose. The case was regarded as one of appendicular abscess, and an operation was performed at once. An incision was made over the swelling close to the anterior superior spine. The deeper layers of the abdominal wall were much infiltrated by inflammatory products, and their identity was obscured. A large collection of thin brown pus was opened. There was neither gas nor odor. It was then seen that the inner wall of the abscess was formed by the postero-external surface of the ascending colon and cæcum, and on this aspect of the cæcum there was a greenish slough the size of a florin. The appendix was found inflamed, but showed no sign of disease arising from within. It was removed and a tube inserted in the abscess cavity. Course of illness after operation: There was a profuse discharge of bile from the tube on the following day, and it was then apparent that the case was one of retroperitoneal abscess from perforation of a duodenal ulcer. As the patient's condition became palpably worse during the next five days, laparotomy was decided on. The peritoneal cavity was normal and no ulcer was seen on the anterior surface of the duodenum. After enveloping, a vertical incision was made through the peritoneum immediately to the other side and parallel to the descending portion of the duodenum. There escaped at once a large quantity of fluid of the same nature as that obtained from the drainage tube. The duodenum thus "mobilized" was quite easily turned forward and to the left, when the perforation was at once apparent. The opening was in the centre of the posterior wall of the descending portion, 1 inch from its beginning. The perforation admitted the tip of the index-finger, and there was hardly any induration of its edges. It was an easy matter to close it by four Lembert sutures; a posterior gastro-enterostomy was quickly done, and the pylorus closed by a ligature. The whole operation occupied less than half an hour. After the operation there was a distinct rally; but during the afternoon the signs of collapse were apparent, and the patient died at noon of the following day.

¹⁰ Telford and Radley: On Retroperitoneal Perforation of the Duodenum. Brit. Med. Journ., May 4, 1912, p. 1002.

OCCLUSION OF THE PYLORUS*

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SINCE 1895, when von Eiselsberg first suggested occlusion of the pylorus in a case of cancer of the stomach, there has been a growing recognition of the necessity of this step in certain cases of pyloric and duodenal ulcers. It is true that a good many surgeons have been opposed to this additional piece of technic. We do not propose to discuss the advisability of this step, as the purpose of this paper is only to compare the efficiency of the different methods of pyloric closure.

We have been unable to find in any of the recent text-books on surgery any mention of pyloric occlusion. We believe, however, that in certain cases of ulcer of the pylorus or duodenum there is a demand for some further procedure to the gastro-enterostomy. It appears to us that the two main indications for pyloric occlusion are, first, the absence of narrowing of the pylorus in chronic ulcers, and, second, active ulcerations of the pylorus and more particularly of the duodenum. It would also seem proper, if a gastro-enterostomy seems necessary after the closure of a perforating ulcer at the pylorus or duodenum (though this is rarely the case), to perform some form of occlusion, particularly if the closure of the perforation seems unsatisfactory. The rationale of the procedure seems to be the diverting of the entire gastric contents through the gastro-enterostomy so that the ulceration may have a chance to heal.

Pyloric exclusion should not be performed indiscriminately and there should be well-defined grounds for its performance. This rule should be particularly enforced if one of the graver forms of procedure, such as the Eiselsberg unilateral exclusion, is chosen.

In the choice of method we should establish as a principle the adoption of a method possessing a reasonable expectancy of efficiency without unduly prolonging the original operation or adding perceptibly to the ordinary dangers, particularly if the patients are poor operative

* Read before the New York Surgical Society, December 9, 1914.

risks. Such a method should be simple in performance, and devoid of danger of hemorrhage or infection. It seems to us that a point to be determined in the future is whether occlusion of the pylorus need be permanent or whether occlusion efficient for some weeks or months only may not suffice to bring about a cure of the underlying conditions.

The principal methods of pyloric exclusion may be divided into four classes:

1. Cutting away all communication between the stomach and duodenum, such as the von Eiselsberg operation.
2. Those which only attempt to produce a partial exclusion, as Bartlett's two methods.
3. Those which produce contractions of the stomach wall by various methods of suture, purse-string and torsion.
4. Those which aim to bring about compression of the pylorus from without by ligatures (Parlavecchio), transplantation of free fascial flaps (Wilms), by compression of the mucous membrane alone (Strauss), or the permanent exclusion by foreign material, such as the magnesium band described by Brewer.

Von Eiselsberg, after performing the gastro-enterostomy, sections the stomach between clamps just proximal to the pylorus and closes the sectioned lumen by inversion of their ends (Fig. 1). We do not believe that such an operation as von Eiselsberg's fills the requirements which we have laid down, for in the simplest case the amount of work to be accomplished is nearly equivalent to a pylorectomy without the advantage of the radical removal of the lesion, which is obtained by the latter operation. We do believe, however, that in this procedure we are more sure of a permanent occlusion, although we cannot be absolutely certain, as one of us has seen the lumen of the duodenum in a dog become patent after it had been sectioned and its ends inverted. Meyer has suggested the use of Hueltl's wire stretching instrument in section of the stomach, as this procedure undoubtedly shortens the time of the operation.

Biondi recently suggested a method of total occlusion free from the dangers involved by the sectioning of the gut. His method consists of a vertical incision over the pyloric portion of the stomach just proximal to the pyloric ring, which is carried down through the serous and muscular coats. These coats are then dissected from the mucosa, leaving a tube of mucous membrane (Fig. 2), which is doubly ligated with chromic gut and divided between them with the actual cautery (Fig. 3), the serous and muscular coats being closed over the stumps with one of the ordinary peritoneal sutures. It appears to us that this is

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a rather difficult and prolonged technic and that the danger of opening the lumen of the intestine is considerable. This author reports that in his experimental work in no case did the lumen of the stomach become patent. We, however, were less fortunate, for in one of our dogs at autopsy it was found that the lumen was patent.

Reichel and Dobertin section the stomach close to the distal portion in the same manner as von Eiselsberg, and then perform gastroenterostomy by anastomosing the proximal end of the stomach to the



FIG. 1.—Von Eiselsberg's method of sectioning the pylorus.

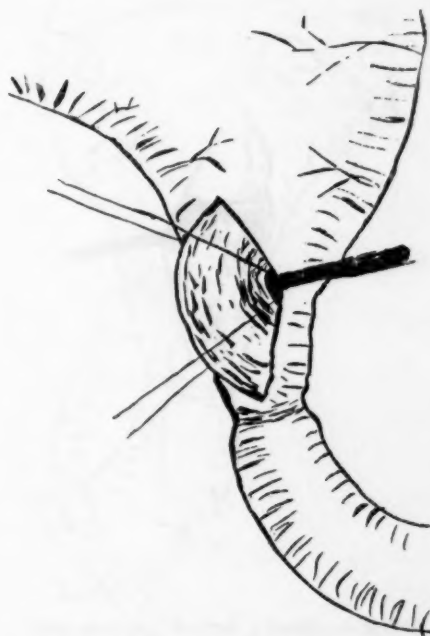


FIG. 2.—First step in Biondi's method. The muscular and serous coats have been separated from the mucous membrane.

side of the loop of jejunum (Fig. 4). Brun, in like manner, joins the proximal end of the pylorus to the duodenum, just distal to the site of the ulcer. These methods, though satisfactory as to the occlusion, are full of dangers because of the difficulties of technic and additional risk of leakage.

Of the methods in the second class, Bartlett has published two which he claims are more simple, take less time, and encounter fewer blood-vessels than the transverse complete division of the organ, and that experimentally they produce similar results. The first of these methods

consists of partial transverse section of the prepyloric portion of the stomach between two clamps. The incision starts at the greater curvature and extends up to within one inch of the lesser curvature, the cut edges of the stomach are then closed by means of a whip stitch, the serous coat being sutured over the edges or together across the gap. In his second method (Fig. 5) he forms a septum across the centre of the lumen of the stomach. The procedure is as follows: A skewer is passed through both coats of the viscus, a short distance above the



FIG. 3.—Biondi's method. Mucous tube has been doubly ligated and divided with actual cautery. Muscular and serous coats are ready to be sutured over the divided ends.

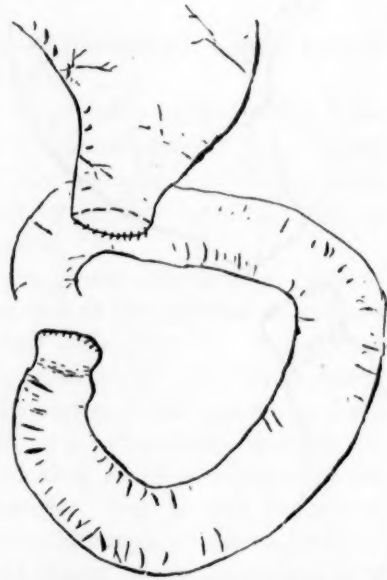


FIG. 4.—Reichel's method. Division of pylorus with anastomosis of proximal end into the jejunum.

greater curvature, and out again through both coats, about the same distance under the lesser curvature; a crushing clamp is then applied just below the point where the skewer lies, thus grasping the four coats of the stomach. The tissue distal to the clamp is removed and the coats are sutured together with three or four chromic gut mattress sutures. The clamp is removed and the cut edges are further strengthened by a running whip stitch, and the peritoneal coat of the anterior wall of the stomach is closed over this with continuous Lembert suture. The technic in both these methods is rather difficult and we believe it adds to the risk of peritonitis from leakage.

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Girard contracts the lumen by means of a pyloroplasty. A transverse incision is made down to the mucous membrane at the pyloric end of the stomach and is then closed longitudinally—a reversal of the Heinecke-Mikulicz procedure. Objection to this method is the same as that of the Bartlett.

In the third class of methods which attempt to occlude the pylorus by various means of infolding sutures and torsion, we need only mention the principal ones. W. J. Mayo and Moynihan advise constriction

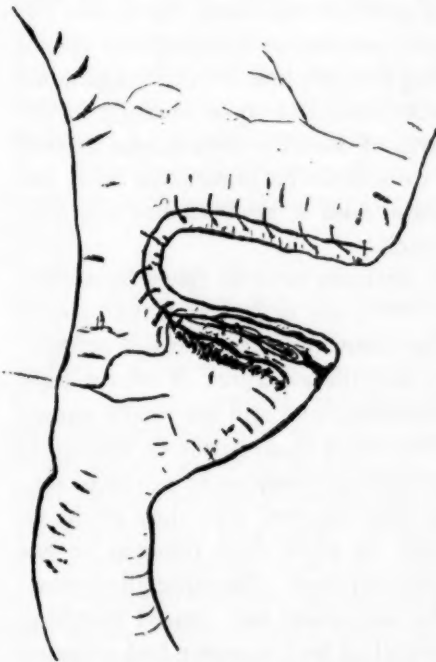


FIG. 5.—Bartlett's second method of partial transverse division of the pylorus.



FIG. 6.—Wilm's method of pyloric occlusion. Suturing of fascial band around the pylorus.

of the pylorus by means of infolding the walls with peritoneal sutures. This method would seem most applicable to those cases in which the ulcer has caused the viscus to become adherent to some surrounding structure from which it would be inadvisable to separate it. Mertens suggests two methods of occlusion: The first, by applying four peritoneal sutures across the stomach and duodenum, two proximal to the pyloric ring and two distal to it. They are tied and the loose ends of the sutures are again tied together, producing a longitudinal as well as a transverse infolding. His second method needs only be men-

tioned; it is simply an attempt at occlusion by torsion of the pyloric portion of the stomach.

The most popular method of pyloric occlusion has been that of compression, especially the one described by Wilms (Fig. 6), where a strip of fascia is sutured around the viscus. The fascia is obtained from the fascia lata or from the anterior rectus sheath; it should be about one-half inch wide and three or four inches long. A clamp is passed through the gastrocolic omentum at a point just under the greater curvature of the stomach and carried out through the gastrohepatic omentum at a corresponding point on the lesser curvature, the ends of the strip of fascia then being grasped by a clamp and drawn through behind the pylorus. In doing this, we find it is of importance that the muscle surfaces of the fascia should be approximated to the serous coat of the stomach. The strip of fascia is then drawn around the pylorus with sufficient tension to occlude its lumen, the ends are sutured together with chromic catgut, and a few stitches are also taken binding the fascia to the stomach.

Silk, cotton and wool, and linen ligatures have at times been used to produce the desired constriction. They are tied around the pylorus sufficiently tight to occlude, care being taken that the gut is not strangulated. It has been found, however, that these sutures, if drawn tight enough to occlude, cut through the intestinal wall and are finally passed out through the intestines. Brewer has used small bands of aluminum which he says are easily applied with sufficient tension to produce complete occlusion of the pylorus. He also suggests that they might be useful to produce temporary occlusion, as after their removal he has shown that the intestine has again become patent. He especially recommends their use in cases where the ulceration has caused bleeding. However, his work is only experimental as he has never had occasion to use this method upon a human being. We are inclined to believe that it would be a rather dangerous procedure to use a rigid, almost non-absorbable material for compression of the intestines.

Hoffman divides the serous and muscular coats, sutures the fascia around the mucous membrane, and closes the two outer layers over it. Recently, Strauss has performed some interesting experiments on dogs by dissecting out the mucous membrane tube of the pylorus in a similar manner to that in which Biondi does, but instead of sectioning the intestine he ligates it with either a band of fascia or a wide strip of tape, finally closing the muscular and serous coats over it. We believe these two last methods are impracticable because of the difficulty in separating

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the mucous membrane from the muscular coats of the stomach without opening its lumen.

Some recent workers, among whom may be mentioned Polya and Bircher, have suggested that instead of fascia being used to produce occlusion a peritoneal band, such as the ligamentum teres of the liver, should be used, this either being entirely freed from its attachments or left attached at its hepatic end. However, the results have not been satisfactory.

In our experimental work we have attempted, as far as possible, to perform some form of occlusion from each one of these groups. In all we did 19 operations. Unfortunately, the kennels had been affected with distemper and the mortality from this condition was extremely high. Our technic in general was to make a three- or four-inch left rectus incision and perform a gastrojejunostomy with four rows of sutures, and then to perform one of the so-called pyloric occlusions. The methods used were Biondi's, Wilms', silk ligature, and chromic catgut ligature.

By means of Biondi's method (Table I) we operated upon three dogs. In the first one, the muscular coats were separated from the mucous membrane with difficulty, the mucous membrane tube being opened and the animal dying later of peritonitis. The result in one of the others was entirely satisfactory, the pylorus being found completely obstructed. In the third dog, however, it was found that the lumen of the intestine had become entirely patent, the only evidence of the operation being a thickened ring of tissue surrounded by dense adhesions. This was rather disappointing, as we firmly believed that if any of the methods used were successful, it would surely be this one.

In occlusion with the fascial band (Table II) seven dogs were operated upon. One of these (dog No. 2) lived only a short time and should not be included in our results. Only one of the animals showed what could be considered a complete functional occlusion. The X-ray, taken some three weeks after operation, showed complete closure of the pylorus, and at autopsy water contained in the stomach did not pass into the duodenum by gravity. In the remaining five dogs the lumen was patent with, however, more or less constriction, as the fascial grafts (Figs. 7 and 8) in all cases had taken and the pylorus was surrounded by dense adhesions. There was undoubtedly some stenosis and in all probability only a small amount of stomach contents passed through, the greater part going through the gastrojejunal anastomosis.

By means of the silk ligature (Table III) we operated upon six dogs. Three of these died within four days. Of the remaining three

in none was there found complete occlusion. In all dense adhesions had formed around the ligature and the silk was found in every instance imbedded deep in the thickened wall. Here the thickening had produced some stenosis but not to the same degree as in the case of the fascia.

Two dogs were operated upon by ligation of the pylorus with ten-day chromic catgut (Table IV). At autopsy, the pylorus was found entirely normal except for the presence of a large number of dense adhesions. No evidence of a ligature could be found in either case. In one of the animals the X-ray taken ten days after operation showed no evidence of patency of the pylorus, all the bismuth apparently passing through the gastrojejunal anastomosis, and at autopsy there was not the slightest obstruction. Judging from this, it may be possible that we have found a method which will produce a temporary obstruction.

Our work with the Biondi method of occlusion was disappointing, first, because of the difficulty in technic and the ease in which the lumen is opened, and, second, because of the uncertainty of its duration.

The experimental results obtained by the fascial transplants have been more or less borne out by their clinical applications. We find in these cases after operation, by means of the X-ray, a certain amount of bismuth passing through the pylorus though the greater amount seems to be carried off by the gastro-enterostomy into the jejunum. Though theoretically this is a failure, practically the results are nearly perfect, as the symptoms usually disappear and the patients are apparently cured. Accordingly, the question may be raised as to whether a complete occlusion of the pylorus is needed in these cases or whether simply a slight constriction of its lumen will produce the desired result. This idea is more or less borne out by the end results obtained by such methods as the Bartlett, which only attempts to produce a partial occlusion.

If simple ligation of the pylorus with a permanent ligature brought any assurance of efficiency it would naturally be the simplest and easiest method to perform. Some authors, particularly Lambotte, have proclaimed its superiority over all other methods, but the bulk of evidence does not appear to corroborate this view. With chromic gut ligatures constricting the pylorus we cannot expect success. Occlusion may be present for a short time, until the ligature is absorbed, but later the lumen is sure to regain its patency.

After considering our experiments and reviewing the literature, we have come to the following conclusions:

For the border-line cases, when occlusion would seem to be indicated

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more as a matter of expediency than actual necessity, we would recommend unreservedly the less severe measures, as constriction or infolding with sutures. Of the former method, we believe at present that the application of a free flap of fascia, when it can be applied, promises the best result. If, however, the adhesions around the pylorus are such that it would be inadvisable to separate them, we would recommend that the constriction be produced by one of the methods of infolding with peritoneal sutures. The more radical procedures, such as the Eiselsberg unilateral exclusion, we would reserve for the severer lesions which call unquestionably for certainty of results. We feel, however, that even in these cases this particular operation will seldom be indicated, for, as a general principle, these severer lesions would probably be better treated by resection, which in severity but little exceeds the unilateral exclusion.

TABLE I
BIONDI'S METHOD

Exp. No.	Duration	Result	Remarks
10	2 days.....		Death from peritonitis due to leakage.
11	26 days.....	Obstruction complete.	
12	29 days.....	Lumen patent.	

TABLE II
OCCLUSION BY FASCIAL BAND

Exp. No.	Duration	Result	Remarks
1	91 days.....	Occlusion incomplete.	
2	4 days.....	Occlusion complete.....	Duration of life too short for any conclusion.
3	88 days.....	Occlusion incomplete.	
5	21 days.....	Functionally complete.....	X-ray findings correspond to those found at autopsy.
14	28 days.....	Occlusion incomplete.	
15	56 days.....	Occlusion incomplete.	
16	56 days.....	Occlusion incomplete.	

TABLE III
OCCLUSION BY SILK LIGATURE

Exp. No.	Duration	Result	Remarks
4	24 hours.....	Complete obstruction.....	Duration of life too short for any conclusion.
6	4 days.....	Occlusion complete.....	Duration of life too short for any conclusion.

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Exp. No.	Duration	Result	Remarks
7	71 days.....	Occlusion incomplete.....	From the X-ray findings there is no evidence of pyloric patency.
8	3 days.....	Complete occlusion	From the X-ray findings there is no evidence of pyloric patency.
17	11 days.....	Occlusion incomplete.	
18	10 days.....	Occlusion incomplete.	

TABLE IV

OCCLUSION BY CHROMIC CATGUT

Exp. No.	Duration	Result	Remarks
9	38 days.....	Incomplete occlusion.....	In the X-ray pictures taken 10 days after operation, no evidence of pyloric patency.
13	29 days.....	Incomplete occlusion.....	Except for a few adhesions, no evidence of chromic gut ligature.

EXPERIMENTAL WORK ON DOGS

EXPERIMENT NO. 1.—October 9, 1914. Fox terrier, female.

Operation.—Posterior gastrojejunostomy was done and the pylorus obstructed by suturing a strip of fascia $\frac{1}{4}$ inch wide, taken from the anterior sheath of the rectus, around the pylorus.

X-ray Findings.—Extensive adhesions show in röntgenograms made immediately after the administration of the bismuth. The pylorus is partially patent. The cap is filled, and in the röntgenograms made twenty minutes later there is evidence of bismuth in the descending duodenum.

Result.—Dog killed January 8, 91 days after operation. Gastro-enterostomy patent, not many adhesions around the pylorus, pyloric lumen fairly wide open though there is some stenosis present.

EXPERIMENT NO. 2.—October 9, 1914. Brown mongrel, male.

Operation.—Posterior gastrojejunostomy was done and the pylorus obstructed by suturing a strip of fascia $\frac{1}{4}$ inch wide, taken from the anterior sheath of the rectus, around the pylorus.

Result.—Was found dead on October 13. Autopsy performed (death from distemper). Gastro-enterostomy was found patent and the fascia appeared to be loosened so that a point of the forceps could be passed through the pylorus.

EXPERIMENT NO. 3.—October 12, 1914. Bulldog, female.

Operation.—Posterior gastrojejunostomy was done and the pylorus obstructed by suturing a strip of fascia $\frac{1}{4}$ inch wide, taken from the anterior sheath of the rectus, around the pylorus.

X-ray Findings.—Extensive adhesions with only a fleck of bismuth in the cap. Duodenal opening, opened; stomach emptying rapidly.



FIG. 7.—Dog No. 3. Occlusion by Wilms' method of fascial transplant. Though occlusion is not complete a marked constriction is present.

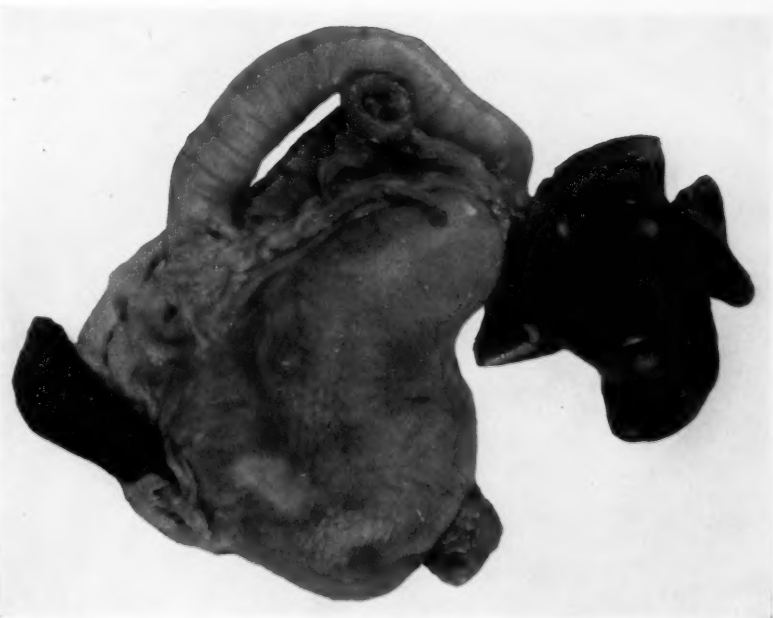


FIG. 8.—Dog No. 16. Occlusion by Wilms' method of fascial transplant. Note the adhesions.



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Result.—Dog killed January 8, 88 days after operation. Autopsy: Gastro-enterostomy patent, pylorus covered with adhesions, fascial transplant present, causing stenosis though complete occlusion is lacking.

EXPERIMENT No. 4.—October 12, 1914. Rough-haired terrier, male.

Operation.—Posterior gastrojejunostomy, pylorus being obstructed by double silk ligature tied tight enough to exclude the lumen of the stomach without causing strangulation.

Result.—Dog found dead the following day. Death from closed loop. Gastro-enterostomy was found patent but the jejunum at this point had become twisted, causing an obstruction in the gut. This resulted in a closed loop between the pylorus and gastro-enterostomy. This loop was much distended and contained bile.

EXPERIMENT No. 5.—October 15, 1914. Brindle mongrel, female.

Operation.—Posterior gastrojejunostomy, pylorus obstructed by suturing a strip of fascia $\frac{1}{4}$ inch wide, taken from the anterior sheath of the rectus, around the pylorus.

X-ray Findings.—Rapid evacuation through gastro-enterostomy. Extensive adhesions around pylorus. No evidence of bismuth in cap or descending duodenum. The röntgenograms were made after the dog died and this accounts for the lack of peristalsis in small intestine.

Result.—Dog died November 5, while being anaesthetized with chloroform, 20 days after operation. Autopsy: Gastro-enterostomy was found patent; pyloric obstruction is complete. No water held in stomach passing through pylorus. The fascia which constricts the pylorus is covered with a layer of peritoneum.

EXPERIMENT No. 6.—October 15, 1914. Terrier, female.

Operation.—Gastrojejunostomy. Pylorus obstructed by tying No. 5 silk ligature around it, tight enough to obstruct its lumen without strangulation.

Result.—Dog died October 19, 1914. Autopsy: Obstruction between pylorus complete. Cause of death pyæmic abscess of liver.

EXPERIMENT No. 7.—October 21, 1914. Bull terrier, male.

Operation.—Gastrojejunostomy. Pylorus obstructed by tying No. 3 silk ligature around it.

X-ray Findings.—Gastro-enterostomy; extensive adhesions around the pylorus. No evidence of pyloric patency.

Result.—Died December 31, 71 days after operation. Cause of death distemper. Gastro-enterostomy found patent, large number of thick adhesions found around the pylorus. On opening the duodenum, pylorus found patent though lumen not as large as normally. Silk found imbedded in adhesion.

EXPERIMENT No. 8.—October 21, 1914. Terrier, female (young puppy).

Operation.—Gastrojejunostomy. Pylorus obstructed by tying No. 3 silk ligature around it.

Result.—Found dead October 24. Gastro-enterostomy patent. Obstruction found complete. No cause of death could be found except the age of the puppy.

EXPERIMENT No. 9.—October 21, 1914. White mongrel terrier, female.

Operation.—Gastrojejunostomy. Pylorus tied off with No. 2 chromic gut suture.

X-ray Findings.—Extensive adhesions; no evidence of bismuth in duodenum or cap; bismuth passing out through gastro-enterostomy.

Result.—Dog died November 28, 38 days after operation. Cause of death

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malnutrition. The gastro-enterostomy was found patent. A large amount of adhesions were found binding the pylorus to the liver and adjacent loops of intestine. The pylorus was opened. No signs of chromic ligature could be found.

EXPERIMENT No. 10.—October 31, 1914. Black setter, male.

Operation.—Gastro-enterostomy. Pylorus closed in following manner: longitudinal incision 1 inch long made over superior surface of pylorus down to the mucous coat. Muscular and serous coats were then dissected free from this tube of mucous membrane, and it was ligated with chromic gut in two places. Tube was sectioned with cautery and serous and muscular coats were sutured with silk.

Result.—Found dead November 2, 1914, 2 days after operation. Cause of death general peritonitis, leakage of obstruction.

EXPERIMENT No. 11.—November 4, 1914. Terrier, male.

Operation.—Posterior jejunostomy. Pylorus closed in following manner: longitudinal incision 1 inch long made over the superior surface of pylorus down to the mucous coat. Muscular and serous coats were then dissected free from this tube of mucous membrane and it was ligated with chromic gut in two places. Tube was sectioned with cautery and serous and muscular coats were sutured with silk.

Result.—Found dead November 30, 26 days after operation. Cause of death distemper. Gastro-enterostomy found patent. There were many adhesions around the pylorus. On opening the duodenum close to the obstruction the pylorus was found entirely obstructed.

EXPERIMENT No. 12.—November 4, 1914. Irish terrier, female.

Operation.—Posterior jejunostomy. Pylorus closed in following manner: longitudinal incision 1 inch long made over superior surface of pylorus down to the mucous coat. Muscular and serous coats were then dissected free from this tube of mucous membrane and it was ligated with chromic gut in two places. Tube was sectioned with cautery and serous and muscular coats were sutured with silk.

Result.—Dog died October 5, 29 days after operation. Cause of death distemper. Gastro-enterostomy patent. Large amount of adhesions around pylorus, lumen of which, however, is entirely open.

EXPERIMENT No. 13.—November 10, 1914. Black terrier, female.

Operation.—Gastroduodenostomy. Pylorus obstructed by tying ligature of No. 1 chromic gut around it.

Result.—Killed December 9, 29 days after operation. No trace of chromic gut and no trace of any narrowing of the pylorus.

EXPERIMENT No. 14.—November 10, 1914. Big brown hound, male.

Operation.—Posterior gastro-enterostomy and obstruction by fascia.

Result.—Died December 8, 28 days after operation. Cause of death distemper. Water trickles through by gravity from stomach and the lumen is obviously patent. The fascia is in place and is vitalized.

EXPERIMENT No. 15.—November 13, 1914. Tan mongrel, male.

Operation.—Posterior gastrojejunostomy was done, the pylorus being obstructed by suturing a strip of fascia $\frac{1}{4}$ inch wide, taken from the anterior sheath of the rectus, around the pylorus.

Result.—Dog killed January 8, 56 days after operation. The liver is very

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adherent to the pyloric portion of the stomach, the pylorus was found covered with adhesions, the gastro-enterostomy was patent and the lumen of the pylorus appeared slightly stenosed.

EXPERIMENT No. 16.—November 13, 1914. Terrier, male.

Operation.—Posterior gastrojejunostomy was done and the pylorus obstructed by suturing a strip of fascia $\frac{1}{4}$ inch wide, taken from the anterior sheath of the rectus, around the pylorus.

Result.—Dog killed January 8, 56 days after operation. The gastro-enterostomy was found to be patent, there were many adhesions around the pylorus binding it to the liver, the omentum was very adherent and the fascial transplant was healthy. The pylorus was constricted but it was still patent. The gastro-enterostomy anastomosis was wide open.

EXPERIMENT No. 17.—November 24, 1914. Terrier, male.

Operation.—Gastrojejunostomy was done and pylorus was obstructed by tying a double piece of No. 5 silk around the pylorus.

Result.—Died December 5, 11 days after operation. Cause of death distemper. Gastro-enterostomy patent. Large amount of adhesions around pylorus in midst of which strand of silk is found. There is only a partial constriction of the lumen.

EXPERIMENT No. 18.—November 24, 1914. Yellow mongrel, male.

Operation.—Gastrojejunostomy was done and pylorus was obstructed by tying a double piece of No. 5 silk around the pylorus.

Result.—Died December 4, 10 days after operation. Cause of death distemper. Gastro-enterostomy patent. Many thick adhesions about the pylorus in midst of which strand of silk is found. Material in stomach passes easily into the duodenum. On opening duodenum, the lumen is found entirely patent.

CLINICAL CASES

Patient, Salvatore I.; male; aged twenty. Admitted June 9, 1914.

Previous History.—Unimportant.

Present Illness.—For a year past patient has suffered frequently from attacks of pain in the abdomen, made worse by taking food. Was under observation in the New York Hospital in spring of 1914. The stomach contents showed blood and hyperacidity. The string tests were sometimes positive, sometimes negative. X-ray pictures negative. The patient's distress disappeared under soft solid diet and rest in bed. Readmitted June 9, with recurrence of all his troubles.

Operation (June 13, 1914).—Irregular, hard, callous ulcer found on the posterior superior wall of the stomach juxta-pyloric. A posterior no-loop gastro-enterostomy—5 rows of sutures—performed with Carwardin clamps. A strip of fascia, $4\frac{1}{2}$ inches long by 1 inch wide, removed from fascia lata and fastened snugly around stomach at the pylorus. Shortly after the pylorus was ligated the patient developed a severe hiccough although fully anæsthetized.

Convalescence.—Convalescence was smooth. Discharged 16 days after operation when it was noted that the patient was taking soft solid diet with no pain and no gastric distress.

Notes.—Reexamined October 5, 1914. Patient presented every appearance of good health and well-being. He complains of occasional feeling of fulness in left side of epigastrium. Digestion good—eats anything. Weighs 140 pounds, a gain of 14 pounds in three months.

Gastric Analysis.—Total quantity 20 c.c. Free HCl 50; total acidity 90. Faint bile stain. Guaiac negative. X-ray shows conclusively that the exclusion is absolute, as bismuth is seen distinctly coming out of the gastro-enterostomy opening while not a vestige of it appears from the pylorus.

Patient, William M.; aged thirty-four.

Gastro-enterostomy with occlusion of the pylorus by strip of fascia on October 12, 1913.

Patient has a very typical history of gastric ulcer verified by various examinations. Also has lues, alcohol and morphine habit. Has been in several hospitals.

The strip of fascia was taken from the abdominal wall. The operation failed to improve the patient and he had a great deal of distress following infection of the wound which broke down, and he left the hospital no better off than when he entered.

Considering the various complications and the patient's mental state, it is a little hard to say to what extent the operation *per se* was a failure.

Patient, Michael H.; aged forty-one.

Symptoms of gastric ulcer for several years. Has been in various hospitals and two operations have been performed on him. He states that one operation was for the removal of two ulcers on the stomach; the other operation we know consisted in a ligation of the gastric artery.

At operation a saddle-shaped ulcer, juxtapyloric on the lesser curvature, was found. No evidences of any previous excision of ulcer. A strip of fascia, taken from the thigh, was placed around the portion of the stomach proximal to the ulcer bearing area.

The patient had a good convalescence, leaving the hospital two weeks after operation. Unfortunately, all attempts to trace him since have failed. It is fair to believe that this operation brought relief.

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APPENDICULAR OBLITERATION*

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OF PHILADELPHIA

MUCH confusion exists in the minds of surgeons as to the significance of the term chronic appendicitis. As it is usually understood it refers either to a state of persistent low grade inflammation involving one or more coats of the appendix, or to recurring attacks separated by intervals during which it may be more or less free from the process or products of inflammation.

As the term is used by the pathologist it may refer not only to the above conditions but also to the results of previous inflammation of the appendix, as evidenced long after the infective process has passed by thickenings, fibrosis, cicatrices, strictures, kinks, and by destruction, absorption and replacement of various portions of its coats, particularly the mucosa. In the former instance the process is still active, though it may be sluggish; in the latter condition it is inactive except as its results may cause disordered conditions. It is the difference between a pathological process and a terminal pathological state. A good parallel may be seen in the chronic endocarditis which, still harboring microorganisms, continues slowly to attack the valves of the heart, as compared with the *so-called* chronic endocarditis which has become sterile and quiescent but acts through the defects and distortions of the leaflets which have been created. Active chronic disease of the appendix betrays itself under the microscope by oedema, hyperæmia, or by the cellular infiltrations which are the hallmarks of chronic infective processes. At a later time the evidences of an active process may be entirely lacking and in their stead we find only the end results above mentioned. It would lead to more accurate thinking and analysis of the true conditions if we were to speak of the former group as chronic active appendicitis and drop the term appendicitis entirely as descriptive of the latter condition, calling it instead appendicular sclerosis or obliteration, as the case may be. We would then be brought forcibly to face with the fact that not all chronic active appendicitis is productive of symptoms, or better perhaps, recognizable symptoms. In a series of 5500 appendices removed by Dr. John B. Deaver, 500 were removed in the course of a laparotomy for other conditions. Of

* Read before the Philadelphia Academy of Surgery, December 7, 1914.

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these, 112 (32.4 per cent.) were found normal and 388 (77.6 per cent.) presented well marked evidence of active or already established inflammatory changes. Of these 388 there were 71 (14.2 per cent.) which had undergone complete obliteration. It is a *reductio ad absurdum* to maintain that more than three-fourths of the entire population have been subject to appendicitis as we know the disease. We must therefore assume that chronic infective processes may go on in the appendix without producing diagnostic symptoms, or that the appendix normally undergoes certain retrogressive processes in the nature of atrophic fibrosis and obliteration. The latter view has been strongly championed by Ribbert. The argument in favor of physiologic involution of the appendix rests chiefly on the fact that the incidence of oblitative processes increases directly as the age, reaching as high as 50 per cent. in the seventh decade of life. When we reflect, however, that an appendix once obliterated is always obliterated the argument loses much of its force, since it is obvious that from whatever cause obliteration proceeds the percentage of frequency must rise with increasing years, just as in the case of gall-stones, which nobody considers a physiologic process for that reason. It is entirely probable that the process is favored by the general atrophy and sclerosis associated with increasing age, but to assume that it is an example of isolated old age in a particular organ, or, what Gowers speaks of as abiotrophy, is no longer tenable. Against this view are (1) the early age at which the process may begin. Obliteration, according to McCarty, may begin as early as the fifth and be complete at the tenth year of life. In the second decade from 3 to 17 per cent. show partial to complete obliteration. This is the period of active growth rather than of degenerative processes. (2) In an operative series the incidence of obliterated appendices does not increase directly with the age, but follows closely the curve of inflammatory diseases of the appendix. Thus in 100 consecutive cases the age incidence was as follows:

First decade	0	Fifth decade	18
Second decade	10	Sixth decade	11
Third decade	31	Seventh decade	3
Fourth decade	27		

The greatest number of cases fell between 20 and 30 years, corresponding to the period most susceptible to recognized appendicitis.

(3) Clinical evidence points clearly to the importance of previous appendiceal inflammation. In 52 consecutive cases operated upon with a diagnosis of chronic appendicitis, 30 gave a history of previous sharp

attacks and 17 had had mild local symptoms. In 48 cases in which the appendix was removed incidentally, 5 gave a history of sharp, definite attacks in the past, 9 of indefinite probable attacks, and 6 complained of chronic indigestion. The history of one case is particularly significant. A man, aged twenty-three, was admitted to the German Hospital with a diagnosis of obstruction of the bowels. Nine months previously he had had a severe attack of acute appendicitis. At operation there were found peri-appendicular adhesions, beneath one of which a knuckle of small intestine had been caught and strangulated. The appendix itself was completely obliterated and inactive.

(4) Operative findings usually suggest previous inflammatory processes. It is not common to find an obliterated appendix swinging freely on a normal meso-appendix. Usually the mesentery is contracted, kinked, or absent. The appendix is frequently subcaecal, paracolic, or bound beneath the terminal mesentery. Often it is subserous. Peri-appendicular adhesions definitely inflammatory in origin were present in 25 per cent. of this series. The attempt of Lane and his followers to attribute most of the appendicular scleroses and obliterations to the consequences of ptosis seems forced in view of the numerous instances of omental and pelvic adhesions which do not admit of any such explanation. That many obliterated appendices do not present peri-appendicular adhesions seems to be due to two facts, namely, the facility with which simple plastic adhesions are later spontaneously released by natural processes leaving no trace behind, and also to the nature of the process of obliteration, which takes two chief forms, and leads us to a consideration of the fifth and pathological reason for assigning infection as the cause of the process.

(5) Obliteration occurs as the result of certain types of acute appendicitis or in consequence of chronic infection of a persistent character with or without exacerbations. It is not exceedingly uncommon to find appendices the mucosa of which has become completely gangrenous without gangrene of the outer coats. This is a consequence of a severe mucosal infection usually aided by increased intra-appendiceal pressure due to proximal blockage of the lumen. If now the obstruction ceases to operate as by the discharge of a concretion into the cæcum or by the softening of a strictured segment, drainage will take place into the cæcum, the mucosa will slough away leaving granulating surfaces which will cohere before epithelialization can take place by continuity from the cæcum. Or, if a perforation occurs at one point and the patient be fortunate enough to recover without removal of his appendix, the end result will be a fibromuscular vestige devoid

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of lumen. In these types of appendicitis permanent peri-appendicular adhesions will often be formed. The case above reported, of rapid obliteration following acute appendicitis with obliteration as a sequel, probably belonged to this class. More frequent than this is the sclerosis and obliteration which results from chronic catarrhal and interstitial processes. I have examined many appendices removed incidentally in the course of abdominal operations for conditions foreign to the appendix in which unmistakable evidences of chronic active inflammation of the organ were present. This occurs not infrequently in the entire absence of any of the recognized symptoms or signs of appendicitis. That this is true is also shown by the large number of cases which present evidences of antecedent inflammation without a history suggestive in any way of appendicitis. All the steps of obliteration can be traced. Cellular infiltration occurs in the outer coats and excites the deposit of fibrous tissue which impedes the blood and lymphatic circulation, renders the organ less elastic, and thus subjects the mucosa to increasing pressure during the periods of œdema and congestion consequent upon the more or less severe exacerbations of infection. In addition to this there is a gradual contraction of the newly-formed diffuse cicatricial tissue. Under these influences the mucosa becomes thin, the glands gradually disappear, the mucosal stroma, and often the lymphoid tissue, undergoes pressure atrophy and disappears. The encroaching fibrous tissue joins across the gap now microscopically minute and appendicular obliteration is complete. Such a process may go on without involving the serosa of the appendix. No adhesions are excited and so slow and inconspicuous may be the whole process that symptoms of any moment may not be called forth, and if they do exist they are most often misinterpreted. Thus, in the 52 cases operated upon with a diagnosis of chronic appendicitis 8 had had a long standing history of indigestion prior to the development of acute attacks and 7 had mild local symptoms preceding a definite seizure which made the diagnosis.

The cause of the symptoms in appendicular obliteration is not only an interesting but important consideration. In what manner does an appendix cause symptoms after it has been reduced to a thin fibromuscular cord devoid of any chronic inflammatory process? That simple removal of such an appendix does abolish symptoms in the majority of cases there can be no question. On the other hand, it is a well-known fact that appendectomy, particularly in this type of case, does not always cure or relieve the symptoms. In 100 cases of chronic appendicitis followed by Stanton with reference to end result, 64 were

cured and 36 were unsatisfactory, in that relief was not obtained or other lesions were found to have been the cause of the symptoms. Graham and Guthrie reported 85 per cent. of cures or improvement, 10 per cent. followed by return of symptoms, and 5 per cent. unimproved. Scudder and Goodall attempted to follow 3000 appendectomies done in the Massachusetts General Hospital, but were able to trace only 640. Of these 94.6 per cent. were cured, but the returns fell so far short of the entire number that this higher percentage is not convincing.

The reasons for failure are various. It is granted that a certain small percentage represents mistakes in diagnosis, the lesion being in no way connected with the appendix or the adjacent bowel. The greatest interest, however, centres in other conditions of the ileocaecum and ascending colon about which it is being attempted to build up pathological and clinical entities. The most important of these are caecum mobile, pericolic membranes and Lane's ileal kink. The discussion of these conditions is not the purpose of this paper, but I wish merely to point out that it is quite unnecessary to refer all failures of appendectomy to the existence of special conditions such as those mentioned.

There are three types of symptoms referable to the obliterated appendix: (1) Those which are referred to other regions of the abdomen, most commonly the epigastrium; (2) local symptoms; (3) general symptoms consequent upon disturbance of function of the bowel.

In this series 4 cases presented epigastric symptoms alone. In 6 others epigastric symptoms were combined with local symptoms. In 2 cases the symptoms were such as to cause suspicion of duodenal ulcer, and in 4 gall-bladder disease was suspected. The occurrence of epigastric symptoms has been plausibly explained by the assumption of reflex nervous influences set up by irritation of the nerve supply of the appendix. In such appendices the ganglion cells of the plexuses of Meissner and Auerbach can easily be seen in a degenerated state. The mechanism exists, therefore, for such action and there seems no reason to doubt that it occurs. Removal of the appendix and with it the irritated ganglionic centres and nerve fibrils should relieve reflex symptoms. Graham and Guthrie's excellent statistics as to cure, above quoted, related particularly to this "dyspeptic" group of chronic appendicitis, and Deaver, Moynihan and many others have placed this type of appendiceal disease on a firm footing as regards its existence and cure.

What is not so well understood, in my opinion, is the fact that local symptoms of appendicular disease do not spring directly from the

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appendix itself. The appendix in common with other portions of the alimentary tube has no perception for pain or power of localization. Its sympathetic nerve supply does not possess this ability and it is doubtful if any spinal fibres reach the appendix. Local symptoms are called forth only by inflammation propagated to other structures possessing sensibility or through the medium of traction upon structures which have spinal innervation, normally the meso-appendix, abnormally acquired adhesions.

In these chronic sclerotic or obliterated appendices, therefore, it is not the inert appendix that is responsible for localizing symptoms, but its shortened and fibrous meso-appendix, the acquired adhesions to adjacent mesentery or parietes, or adhesions of the cæcum, colon or small intestine, the consequences of peritoneal infection and, most important, retroperitoneal lymphangitis, which disturb the motility of the bowel and under conditions of distention or activity or during peristalsis excite pain. The appendix in many cases acts as a guy rope attached to the tip of the cæcum preventing foreshortening and emptying of the cæcum by the longitudinal muscles.

Disturbance of function of the ileocæcum manifests itself by a further train of symptoms, chief of which is constipation. It is probable that in some cases chronic toxic manifestations are a result. Just what proportion of the "grisly troop" enumerated by Lane and Metchnikoff are due to this cause remains to be determined.

Appendectomy releases the cæcum from the tether of an adherent appendix and the contracted meso-appendix. At times other symptom-producing adhesions are released as well. In other cases through ignorance of the exact organic cause of symptoms or because of operative difficulties the essential factors are left behind when the appendix has been removed. It is asking too much to expect that simple appendectomy will relieve all symptoms due not only to the appendix but also to complications secondary to the appendicular disease but no longer dependent upon it. Just what constitutes a normal arrangement of the ileo-cæco-colic region, how much divergence may occur without symptoms, what type and situation of adhesions are most troublesome, and how to remedy them, are questions that do not at present permit an answer, but it is clear that the attachments of the bowel in the ileo-cæcal region have a most important bearing upon function and symptoms and that it is the surgeon's duty at present to observe and digest before generalizing.

In this series but one case of associated Lane's kink and Jackson's membrane was observed, and in this instance there were omental ad-

hesions to the parietal peritoneum in the right iliac fossa. Whether the disease of the appendix had been responsible in this instance for the other abnormalities it is impossible to say but the evidence of former adhesive inflammation in this quarter is at least suggestive.

Constipation, at times amounting to intestinal stasis, was the rule in this series. In only 5 were the bowels said to be regular. Two were inclined to diarrhoea. Twenty-five, or about half, were troubled by constipation and in 20 no note was made of the condition of the bowels. The appetite in general was good. Nausea and vomiting were rare, except in connection with a history of definite seizure of pain in previous attacks. Indigestion was admitted in 26, denied in 3, not mentioned in 23. Some form of pain or distress was complained of in every case in which a pre-operative diagnosis of chronic appendicitis was made. It was variously described as dull, aching, dragging, sticking, sharp, crampy and soreness. In 27 cases it was in the right iliac fossa alone, in 5 cases in the epigastrium alone, in 6 cases in both, in 2 it was general, in 3 there were radiations to the right loin and thigh, and in 9 it was aggravated by exercise or activity. The symptoms dated back according to the history from 4 days to 25 years, with an average of more than 5 years. Only 7 gave the duration in months, and in 33 it had been a matter of years. Females predominated, 31 to 21. The leucocytes averaged 8620 per cubic millimetre with a minimum of 4600 and a maximum of 14,500. The few cases which showed some fever, leucocytosis and evidence of inflammatory exacerbation were not instances of complete obliteration. When the obliterative process has reached the cæcal junction there is no longer opportunity for bacterial invasion, a condition dubbed by Morris, protective appendicitis.

The 46 cases of incidental removal of obliterated appendices were distributed among 11 different abdominal diseases, to enumerate which would serve no purpose. It is a curious fact, however probably a mere coincidence, that 7 were removed during operations for extra-uterine pregnancy. During this same period the total number of cases operated on for this condition was 19, so that one in three of the cases of extra-uterine pregnancy presented obliterated appendices. As all these cases gave evidence of chronic or subacute tubal disease it is not beyond the bounds of possibility that the previous appendicitis had been the true starting point of the subsequent extra-uterine pregnancy through the well-known tendency of infective processes from the appendix to communicate disease to the tubes, which in turn would predispose to tubal gestation.

For the privilege of analyzing 100 consecutive cases of appendicular

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obliteration operated upon by Dr. John B. Deaver I wish to thank him as well as to acknowledge that my opportunity for observing clinically the conditions to which I have directed attention in this paper are largely due to my association with him. In conclusion it should be recognized that:

(1) Appendicular sclerosis and its terminal stage, appendicular obliteration, differ pathologically and clinically from chronic active appendicitis.

(2) Three types of symptoms are to be considered: (*a*) reflex, due to irritation of the nervous mechanism of the appendix; (*b*) local, due to mesenteric and peritoneal contractions and inflammatory bands or adhesions affecting the appendix, cæcum, ileum or ascending colon; (*c*) consecutive symptoms, general and local, consequent upon disturbed function of the ileocaecal region.

(3) Simple appendectomy avails for reflex symptoms, but in local and consecutive symptoms only in so far as the operation permanently frees symptom-producing contractions, sclerosis or adhesions.

(4) The determination of these latter conditions and the appropriate treatment therefor awaits further observations and experience.

THE MAJOR PROCEDURE FIRST IN THE TWO-STAGE OPERATION FOR RELIEF OF CANCER OF THE RECTUM *

BY ROBERT C. COFFEY, M.D.

OF PORTLAND, OREGON

A FEW years ago the operation for cancer of the rectum was considered quite a hopeless procedure. At the present time the application of the principles of treating cancer elsewhere has made the removal of cancer of the rectum one of the most hopeful of operations for internal cancer, as far as permanent cure is concerned. In our own cases the end results have been decidedly better after removal of cancer of the rectum than removal of cancer of the pylorus. Even at the present day, however, the operation for removal of cancer of the rectum is one of the most formidable operations and has a high mortality. Up until three years ago the mortality following operations of cancer of the rectum was between 20 and 30 per cent. Statistics of the Mayo Clinic show 12 per cent. for the year 1913. Crile reports improved results from the application of the principles of anoci-association in operations for rectal cancers. However, nothing has reduced the mortality so much as doing the operation in two stages. In the August, 1912, number of *ANNALS OF SURGERY*, Dr. W. J. Mayo says: "The combined abdominosacral operation in two stages has much to commend it and has a mortality of less than one-half that of the abdominoperineal operation in one stage." I believe I am safe in saying that most conservative men at this time are doing a two-stage operation. I believe I am also safe in saying that any operation which includes in its purpose the preservation of the sphincter has not been satisfactory, except in very rare instances. While the condition thus procured would be most desirable, the procedure is not in harmony with the principles on which successful cancer surgery of other parts of the body has been based, and as a result the recurrences have been out of all proportion to the benefits derived. Therefore, we must content ourselves with the sacrifice of the sphincter in a great majority of cases, in order to procure a better curative end result.

The sacral anus has not been very satisfactory. In an experience of a considerable number of cases by this method, as well as with the

* Read before the Idaho State Medical Society, October 8, 1914.

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anus made through the left rectus muscle, we are forced to the conclusion that the anterior anus is far more convenient and satisfactory to the patient, although it is very hard to convince the patient before operation that the anus in this abnormal position is more desirable than an anus without a sphincter near the normal location. The very best that we can offer a patient today is an abdominosacral operation in two stages, with the anus in front either through the rectus or near the axillary line on the side. I prefer the anterior opening through the rectus.

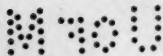
Dr. W. J. Mayo, in the article above referred to, gives two methods of the two-stage operation, one in which a simple colostomy is done in the first stage, and the Kraske operation performed at the second stage, leaving a closed end of sigmoid below the colostomy. "Second: For cases in which the growth extends high, in the lower sigmoid." In this group of cases the sigmoid is mobilized down to Douglas' pouch, the fat and glands separated from their posterior attachment to this point, the sigmoid is cut in two and the distal end closed with sutures, and with the attached fat and glands is depressed and the peritoneum closed down over the top of the mass, while the proximal end of the sigmoid is brought up through the left rectus. In this operation he found it necessary to pass a tube through the natural anus into the segment of the intestine above the growth, in order to keep it well cleansed. From seven to twelve days later the growth is removed. He says this method has a slightly higher mortality than the other two-stage operation, in which the sigmoid was not severed at the first operation, and incidentally states, "We had one patient die several days following the colostomy, from perforation of the lower segment," which danger I think may possibly account for the increased mortality reported as following the operation in which the sigmoid was severed at the first operation.

In my own work the shock and the mortality have been decidedly less where I have separated the sigmoid at the first operation. Because of this perforation reported by Dr. Mayo in this article, we have modified the technic and now perform the operation as follows:

First: A fair sized rectal tube with an eye on each side is passed into the rectum beyond the growth, in order to allow the contents of the sigmoid and rectum above the growth to drain while the operation proceeds.

Second: The abdomen is opened in the median line from the umbilicus to the pubes. All the small intestines are packed back into the upper abdomen with gauze, and the sides of the pelvis protected with large gauze packs, the wound being held open by a Balfour

retractor. The sigmoid is picked up and mobilized down into Douglas' cul-de-sac as follows: The peritoneum on each side is nicked, a blade of a Mayo dissecting scissors is passed between the peritoneum and vessels, and by pushing the partly closed scissors on the tense peritoneum downward, the peritoneum is cut without the injury of any of the mesenteric vessels (Fig. 1). The mesenteric vessels are then ligated, the sigmoid is clamped by two angiotribe forceps, and cut between them by cautery, which is allowed to heat the clamp sufficient to sterilize the tissues in the blades (Fig. 2). A continuous suture is then passed around the forceps through the intestine, after which the forceps is removed and the suture is continued back across the intestine to the original point of entrance, and the two ends tied together, as shown in Fig. 2. Both the proximal and distal ends of the sigmoid are treated in this way, after which the ends are sterilized with pure tincture of iodine. The proximal end is wrapped in a pack of gauze and held until the distal end is cared for. All the fat and other tissues attached to the distal portion of the intestine are trimmed away so as to make the bulk as small as possible. The rectal tube is then pushed up to the upper end of the distal segment, and a very strong double thread is passed through the intestinal wall, through the eye of the rectal tube and out on the other side of the line of suture, and the tube thereby fastened to the sutured end of the gut from its inside (Fig. 3). This distal section is again painted over with iodine for most of its length, and its walls grasped on each side by forceps, while traction is made on the rectal tube from below. This inverts the large intestine down to the forceps. Another bite lower down is taken by the forceps, and the intestine further inverted. The tube is then pulled down as far as possible, so that the end of the sigmoid protrudes through the rectum and the peritoneal funnel above is closed by two or three catgut sutures. The superior hemorrhoidal artery, which runs in the mesentery of the sigmoid, is doubly ligated and severed between the ligatures, and the lower end with the fat and glands of the mesentery are separated from the sacrum and pushed down. The peritoneum then is drawn over by continuous suture, covering in all the fat surface left by mobilizing the sigmoid, and is drawn entirely over the inverted distal end (Fig. 4). In women we have, in addition to this line of suture, sutured the uterus and broad ligaments across the pelvis, making the rectum still more extraperitoneal. The proximal end is again painted with iodine and drawn through an opening in the middle of the left rectus just below the umbilicus, and sutured to the peritoneum, the aponeurosis and the skin by separate layers of interrupted sutures of linen. The



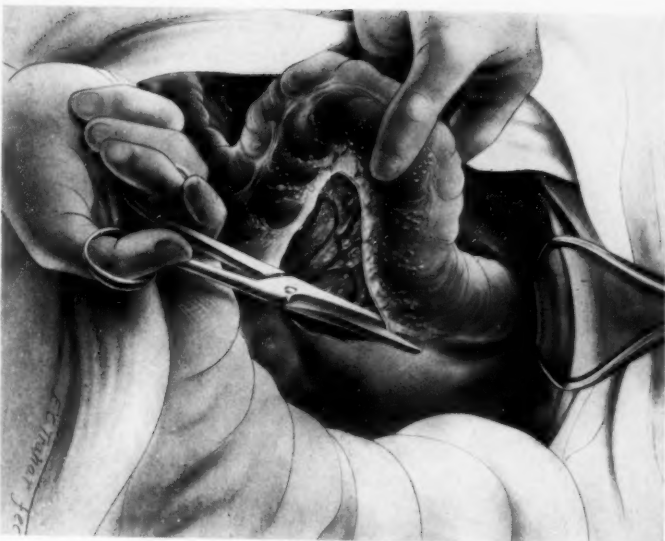


Fig. 1.—The sigmoid is mobilized by cutting the peritoneum on each side of its mesentery.



Fig. 2.—The sigmoid is cut between angiostatic forceps with a cautery and the forceps heated sufficiently to sterilize the ends. Ends are closed and painted with tincture of iodine, and mesenteric vessels tied.

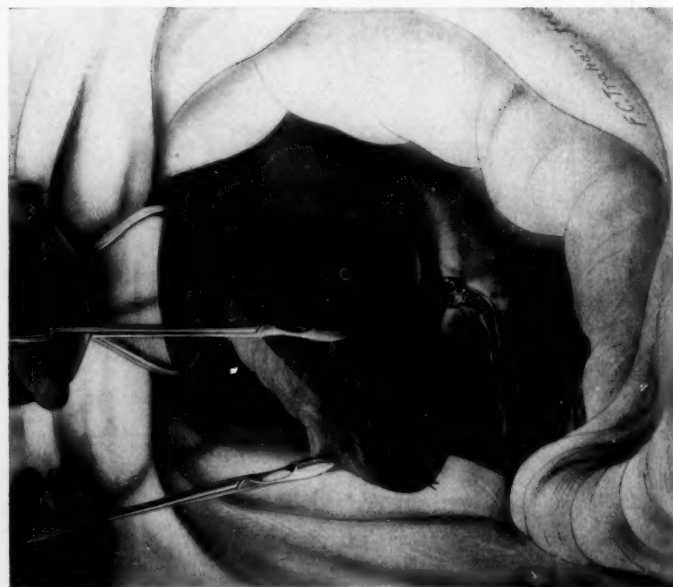


FIG. 3.—Proximal sigmoid wrapped in gauze. Tube is passed up to end of distal sigmoid, where it is fastened by a strong double suture passed through the intestine and eyes of tube and tied. When the intestine is held by two forceps and traction is made on the tube, inversion is produced. Note the ends of the severed superior hemorrhoidal artery.

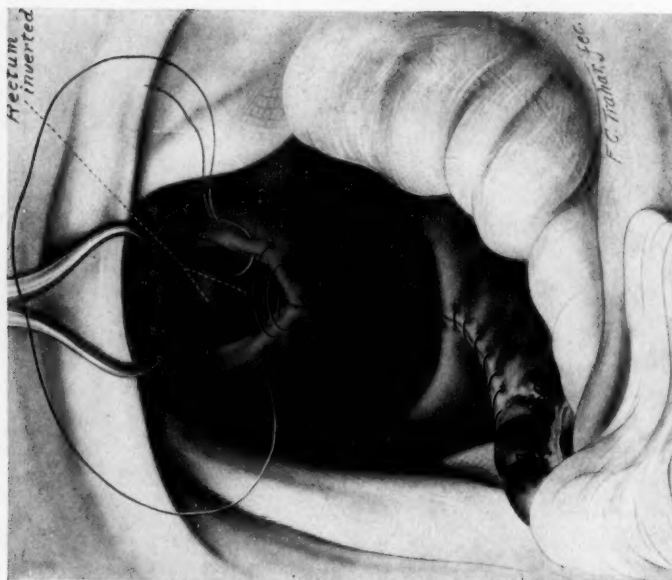


FIG. 4.—After the distal sigmoid has been inverted and drawn out through the anus, the inverted end is closed by three or four interrupted catgut sutures, and a continuous catgut suture is run along the mesosigmoid, covering the raw fat edges with peritoneum from the proximal sigmoid to the bottom of the cul-de-sac.

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protruding end is clamped and twenty-four to forty-eight hours later is cauterized external to the clamp and the clamp removed.

In four of the eight cases which we have done during the past year by this method, we have ligated both internal iliac arteries, in addition to the superior hemorrhoidal artery, at the primary operation. It has seemed that the hemorrhage at the second operation has been decidedly less, and the danger of the first stage has not been materially increased

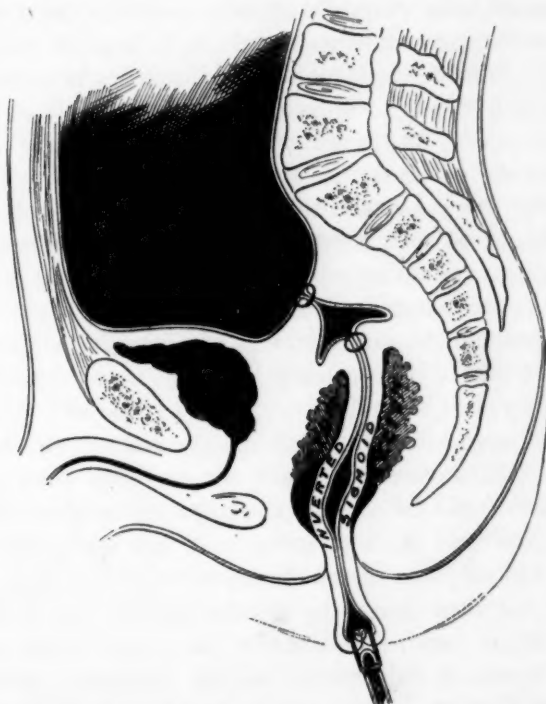


FIG. 5.—Sectional view of sigmoid inverted and drawn out through the anus. Also the peritoneum sutured over end of inverted gut.

by ligating the internal iliac. Yet, I am not sure that it has many advantages. We have found the patients apparently in the best state for the second operation, from twelve to twenty days after the first. The second operation consists of removing the coccyx and last sacral vertebra and very radical excision of the entire rectum and surrounding connective tissue and fat, also the sphincter. At this time the second operation produces practically no shock and may almost be said to be a minor operation. The peritoneum has not been opened except in one case, and in this case the cancer extended so far up that the operation

should not have been attempted. This was the only death in the eight cases by this method. This method is certainly less shocking than any other that we have tried, and is particularly applicable to cancers of the rectum proper, even those cases involving the sphincter. The operation of course is not applicable in cases of total obstruction.

The second stage of the operation is particularly suited to spinal anæsthesia or to gas anæsthesia.

PAINFUL SUBCUTANEOUS TUBERCLE*

BY H. R. OWEN, M.D.

OF PHILADELPHIA

A PAINFUL subcutaneous tubercle is literally what the name denotes. Were the name changed to painful subcutaneous neurofibroma, not only the chief symptoms but also the pathology would be told. These tumors have been described by A. Petit, Cheselden, Camper, Paget and others. Mr. William Wood¹ in 1812 described them, and gave to them the name they have since borne. The subject is discussed in a few of our modern surgeries and in few pathologies. The older surgeons treated the subject to greater length. Good descriptions may be found in Agnew's Surgery and Gross's Surgery. Of the modern surgeries, DaCosta, Treves, and Rose and Carliss² relate the occurrences of these tumors. Whereas painful subcutaneous tubercles are not common, on the other hand they cannot be called rare. When met with, they are not difficult of diagnosis. The seat of the growth of these little tumors is in the subcutaneous areolar and adipose tissue: they are usually found on the extremities, more often on the lower extremities than on the upper. Gross² is the only writer whose experience led him to believe that the upper extremity was the more usual location for their growth. He found they occurred more frequently on the shoulder and arm. In one case, which I had the opportunity of seeing with Dr. DaCosta last winter, the tumor was in the subcutaneous tissue of the chest. This specimen was afterward shown before the Academy of Surgery. Brodie³ reported cases in which the tumor occurred upon the face. Robert W. Smith⁴ reported two cases occurring on the fingers, and Sir James Paget⁵ removed such a tumor from a thumb. Whereas the painful tubercles usually lie just beneath the skin, they are seldom attached thereto. A painful tubercle has a well-defined capsule which is usually loosely connected with the surrounding tissues. The overlying skin is not usually discolored, but, in the exceptional case when the tumor is attached to the skin, the skin is thin, polished and the superficial blood-vessels are tortuous and enlarged. This, as stated, however, is exceptional, as the tumor is usually freely movable, and the palpating fingers can move the tumor around under the skin within

* Read before the Philadelphia Academy of Surgery, December 7, 1914.

a radius of one or even several inches. In a case in which the tumor lay in the subcutaneous tissues over the patella, it could be moved over the entire patella.

Such tumors are found in women far more frequently than in men. Neuromata, with which painful subcutaneous tubercles are often confused, are found more often in men. Paget ⁶ gives the following table of statistics: in 26 cases of neuroma, 19 were in men and 7 in women; whereas, in 28 cases of painful subcutaneous tubercle, 23 were in women and 5 in men. It usually occurs singly, although W. Wood ⁷ reported a case in which three of these tumors were removed from the tissues overlying the glutæus maximus muscle.

It is either round or oval in shape, and usually about the size of a pea, though it may be somewhat larger. In consistency, it is very firm and it feels elastic when rolled between the fingers. According to Caruthers,⁸ the tumor occasionally has a central cavity filled with fluid. In only one case reported, which will be mentioned later, has there been any tendency to ulcerate or break down.

Of the *symptoms*, the most characteristic is the pain which is radiating and neuralgic in type. This pain is greatly increased when the tumor is palpated, as the tumor itself is exquisitely tender; in fact, the tenderness is so marked that the patient is usually very apprehensive about the handling of the region. The patient from whom I removed such a tubercle from above the patella was not only afraid to kneel down because of pain, but, for several weeks prior to the operation, had been so apprehensive of pain, that she walked with her knee stiff, fearing to bend the joint. The tubercle when removed was round, very firm and no larger than a pea.

The pain is not usually continuous, but occurs in paroxysms. These paroxysms may last for many hours if the tumor has received a blow. If such a tumor on an arm or leg receive a blow, the extremity may be thrown into a clonic convulsion. The patient may fall because of pain, and not infrequently faints if the tumor is struck. The pain is often exaggerated during mental emotion, especially during the menstrual period. In the exceptional case, if the tumor has received a blow, the surrounding parts may become cedematous, simulating angioneurotic edema.

The *structure* of these tumors appears still to be somewhat in doubt; they are now usually classified under "neurofibroma."

Velpéau⁹ believed them to be neuromata of subcutaneous nerves. This theory is held by others. In the *American Text-book of Surgery*,¹⁰ we find the statement,

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"The painful subcutaneous tubercle is connected with a sensory filament of a cutaneous nerve" and "is usually made up of fibrous tissue." Keen¹¹ classifies them under neuromata and states, "when one grows on a terminal twig of a cutaneous nerve, it gives rise to so much pain, which is often like an electric shock when touched, that it is in consequence "a painful subcutaneous tubercle." Gross¹² also classified them under neuromata, stating that "a few fine examples of neuroma in the form of the painful subcutaneous tubercle of the hand are on record." Treves¹³ and DaCosta¹⁴ classify such tumors under fibromata. DaCosta states that "nerve fibrillæ are now known to exist in these tubercles, a fact which was long denied." McFarland¹⁵ says of the painful subcutaneous tubercle, "it consists of fibro-connective tissue, in which some claim to have found nerve filaments."

In two cases, in which I had the specimens examined, nerve filaments were found in each, the pathological report being "neurofibroma." Some surgeons, however, have not taken the same attitude regarding the pathology.

Agnew,¹⁶ speaking of such a tumor, said, "though it contains no demonstrative nerve elements, being composed only of fat and connective tissue, it undoubtedly has some relation to adjacent nerves, or, it may be that some of the supposed connective-tissue fibres are amyelinic nerve fibres."

Dupuytren¹⁷ stated that he dissected several such tumors with minute care, and never saw even the smallest nervous filaments adhering to their surfaces.

Paget¹⁸ was of the same opinion. He was never able to find existing nerve-fibres in the tumor. He was disposed to think that most of them are only connected with nerves, as ordinary innocent tumors are, that receive a few fibres in their substance.

Because of the fact that the pain of these tumors is so out of proportion to their size, and because he was unable to find nerve structures within the tumor, he believed that the excruciating pain should be assigned to a "functional rather than to an organic disorder of the nerves; to a disorder commencing in the nerves of the part which is the focus of the pain, but transmitted from them to others, which, in the nervous centres, are connected with them."

It cannot be possible that the pain is due purely to altered nerve fibres, as even tumors within nerves are not always exquisitely painful, and, as pointed out by Smith,¹⁹ there is often little or no pain in cases of tumors which have existed in the trunks of nerves.

Stengel²⁰ classifies tubercle dolorosa under myomata, stating that "myomata of the skin occur in younger patients, even in childhood, and are generally multiple, and often painful." I believe, however, that these must be another variety of painful tubercles. Such tumors have always been described as being benign, but Warren²¹ describes one malignant form of these tubercles in which the lymphatics may become involved, but he cites no cases. I was able to find only one case re-

ported wherein the tumor became malignant. This was a case of painful subcutaneous tubercle reported by Dupuytren,²² in which the tubercle acquired a schirrous nature and underwent cancerous softening.

The painful subcutaneous tumor may be diagnosed from a neuroma, by the fact that the former is usually single, whereas the latter is more often multiple; the former occurs more frequently in women, the latter in men; the former grow slowly, some attain full growth and remain stationary, and never attain any considerable size; whereas the latter grow consistently and have no limit to their size.

The treatment of the painful subcutaneous tubercle consists in excision. The authors of the *American Text-book of Surgery*,²³ in speaking of treatment, say: "the treatment is excision of the tumor together with the portion of nerve twig in which it grows." It is not always possible, however, to find such a twig. Gross,²⁴ in summing up the treatment, says there should be "free excision, including a portion of the surrounding healthy integument."

The tubercle can be removed under local anæsthesia. In those which I have removed, however, I used nitrous oxide gas, because of the fact that the tubercles usually occur in the nervous type of women, and because the tubercles were so small that I feared they would be hard to find after infiltrating with a local anæsthetic. Because of the fact that the tubercle is often so small and movable, it is well to fix it with a needle before making the incision so that it may be readily found. Cases have been reported in which the tubercle recurred after removal. Sir Astley Cooper²⁵ reported such a case in which he removed two painful subcutaneous tubercles from a woman's leg at an interval of a year. Similar cases have been reported by Paget and Tait.

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- ¹ Wood: Edinburgh Med. and Surg. Jour., vol. viii, 1812.
- ² Gross: System of Surgery, vol. i, p. 235, and vol. ii, p. 1017.
- ³ Brodie: Med. Gazette, vol. xxi, p. 926.
- ⁴ Smith: Treatise on Neuroma.
- ⁵ Paget: Lectures on Surgical Pathology, p. 487.
- ⁶ Paget: *Ibid.*
- ⁷ Wood: *Ibid.*
- ⁸ Carruthers: Edinburgh Med. and Surg. Jour., vol. xxxiii.
- ⁹ Médecine Opératoire, vol. iii, p. 101.
- ¹⁰ American Text-Book of Surgery, p. 412.
- ¹¹ Keen: Keen's Surgery, vol. i, p. 761.
- ¹² Gross: System of Surgery, vol. i, p. 1017.
- ¹³ Treves' Surgery, vol. i, p. 458.
- ¹⁴ DaCosta: Modern Surgery, 1914, p. 355.

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- ¹⁵ McFarland: Text-Book on Pathology, p. 234.
- ¹⁶ Agnew's Surgery, vol. iii, p. 624.
- ¹⁷ Dupuytren: Leçons Orales, vol. i.
- ¹⁸ Paget: *Ibid.*
- ¹⁹ Smith: *Ibid.*
- ²⁰ Stengel: Text-Book on Pathology, 1906, p. 185.
- ²¹ Warren: On Tumors, p. 60.
- ²² Dupuytren: *Ibid.*, p. 542.
- ²³ American Text-Book of Surgery, p. 414.
- ²⁴ Gross: *Ibid.*
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- ²⁶ Rose and Carliss: 1914, p. 213.

TYPHOID SPINE*

WITH REPORT OF FOUR CASES

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OVER one hundred cases of typhoid spine have been reported since the publication of the first paper calling attention to this condition by Gibney in 1889. Gibney expressed the opinion that in typhoid spine there is "an acute inflammation of the periosteum and the fibrous structures which hold the spine together." The next important paper on this subject, a few years later, was by Osler, who, unfortunately, in reporting some of his own cases described the condition as a pure neurosis. The pathology of typhoid spine has been the subject of much theoretical discussion along the lines of the divergent views expressed by Gibney and Osler.

The only reported autopsy examination was not performed with sufficient detail to throw much light on the lesions present. The only complete post-mortem study of which I have any knowledge is that made by J. Torrance Rugh in a case some years after the disappearance of the acute symptoms.

The earlier cases of typhoid spine were observed before the days of the X-ray or before X-ray technic had developed sufficiently to demonstrate the spinal lesions. Even in many of the recently reported cases skiagrams were not taken. Thus far, less than 30 cases of typhoid spine have been reported in which X-ray pictures were taken and in some of these the skiagrams were negative. To this list I have added three personal cases in which the X-ray disclosed definite bone changes. Sufficient evidence has been accumulated to prove definitely that Gibney was correct in his original view that an inflammatory organic lesion does occur in these cases.

That a pure neurosis might possibly simulate, to a certain extent, the true inflammatory organic lesion of typhoid spine just as it might simulate any other organic lesion cannot be denied, but in view of our present knowledge of the subject such confusion should not occur. In other words, those cases which only simulate typhoid spine, whether because of a neurosis, a toxæmia, or any other cause, but which do not present

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organic changes should henceforth be excluded from the list of true typhoid spine cases. The fact that the skiagram has been negative in a few cases does not in itself disprove the presence of an organic lesion; the bone changes may have been too slight to be demonstrable or the pictures were either faulty, or, when taken early in the course of the disease, were negative, when later ones might have shown bone changes, as in my third case.

The statistics on the reported cases of typhoid spine have been collected and analyzed by Cutler, Silver, Halpenny, Rogers, Gaudefroy, Elkin and Halpenny, and others. It has been found that fully 85 per cent. of the cases occur in males. The youngest patient was eight years and the oldest fifty-six years, but the majority were between twenty and thirty-five years.

Typhoid spine occurs as commonly in mild cases of typhoid fever as in severe ones. In the vast majority of instances the affection is located in the lumbar spine or in it and the immediately adjacent thoracic or sacral vertebræ, although it has been reported affecting only the thoracic or cervical vertebræ, or, as in a case reported to this Society by Dr. Elmer, involving only the sacro-iliac joint. Commonly only two adjacent vertebræ are involved, though, rarely, several may be.

Pathology.—That the affection is located so commonly in the lumbar spine is due to various factors. Fraenkel found typhoid bacilli more frequently in the vertebræ of the lumbar region than elsewhere, due probably to the relatively larger amount of bone marrow in them. The lumbar spine is also normally subjected to greater stress and strains than is the remainder of the spinal column. Silver has further suggested that, in addition to the greater amount of cancellous tissue offering low resistance to the typhoid bacilli, there is the possibility of direct infection from the adjacent lumbar lymph-nodes. Typhoid spine is almost never a fatal affection, hence post-mortem study of recent cases is wanting.

The clinical evidence points to the lesion being a spondylitis with periostitis, enchondritis and deposit of inflammatory exudate. The X-ray has demonstrated absorption of the intervertebral disc and slight destructive changes in the bodies of the vertebræ as the earlier changes; and later, bone proliferation from the periosteum and bone deposition along the lateral ligaments producing firm bony ankylosis of the approximated adjacent vertebral bodies.

The infrequency of suppuration in the vertebræ as compared to typhoid lesions in other bones has never been satisfactorily explained.

The cause of referred pains and rhythmical contractions is some-

what problematical. They may be due to neuritis from extension of the inflammation and this seems suggested by evidence of organic nerve lesions in some cases. Again they may result from meningitis. Positive Kernig's sign has been noted but only rarely. Lumbar puncture has shown the tension of the spinal fluid increased in a few instances and normal in others. Pressure on the spinal nerves or nerve roots by inflammatory exudate seems the most probable cause. Those cases in which there are alternations of the referred pains and rhythmic muscular spasms suggest that whatever irritation is present in those cases must be located at some point where the motor and sensory fibres are separated one from the other. This would imply an exudate exerting pressure on the anterior and posterior spinal nerve roots proximal to their passage through the intervertebral foramina. The rhythmic contractions being synchronous with the pulse, would indicate they were due to pressure which would alternately be increased and decreased as the blood was forced through the pressure area.

The onset of symptoms was usually gradual, but in many was abrupt and acute, occurring in a few cases during the febrile period, most often during convalescence, and quite frequently some weeks or months, in one case four years, after recovery from typhoid fever.

There seems no doubt that the typhoid bacillus is the cause of the lesion. The presence of typhoid bacilli in bone marrow, especially of the spine, in patients dying of typhoid fever has been shown by Quincke and by Fraenkel.

Various forms of slight trauma or exposure to wet and cold were given as the immediate cause for the onset in many cases. It is quite probable, however, that the spinal lesion was already present and that the trauma merely aggravated it or first called attention to its existence. This would seem to be the case in those patients in whom acute symptoms developed within a few hours after receipt of the trauma.

The symptoms of typhoid spine can be classified as (1) constitutional, (2) local or spinal, and (3) referred.

Constitutional Symptoms.—The patient's temperature in one case was normal, but in all others reported in which the temperature was given it was elevated, seldom reaching 103° or 104° F., but in one of my patients going to 106° F. in the first twelve hours. Fever usually subsided in a few weeks and persisted only two months in the longest instance recorded. The pulse-rate increased with the fever. The Widal tests, when taken, have been positive. Leucocyte counts have not been reported very frequently and have varied from 6000 to less than 18,000.

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Great mental irritability has been noted in several instances, due probably to weakness from prolonged illness, present toxæmia, and harassing pain. A few patients threatened to commit suicide. This irritability in its various manifestations has been one of the main arguments in the past for regarding typhoid spine as a neurosis. As one writer has pointed out, if these patients with their painful organic lesions are treated as cases of neurosis, ordered out of bed, placed on exercises, etc., it might reasonably be expected that they would display "neurotic" symptoms.

Local or Spinal Symptoms.—Pain over the spine has been the most constant and prominent symptom, as well as usually the first to attract attention. The local pain, however, has sometimes been overshadowed by the greater intensity of the referred pains. Local pain over the site of the disease has usually been absent when the patient was at complete rest in bed, but was elicited by movements of the spine, whether by turning in bed or tests applied in making an examination. Downward push on the head or shoulders, jarring on the heels and efforts at bending or twisting the spine have aggravated this pain. The patients have protected themselves against exciting the pain, in the manner characteristic of cases of acute inflammatory lesions of the spine, by transferring weight through their arms and hands to their pelvis, thighs, bed, or chair; and picking articles from the floor by flexing the knees and hips rather than bending the spine. The pain has disappeared during the subsiding stage for days or weeks to recur on resumption of active exercise or labor.

Tenderness was elicited either over the spinous processes in the median line, or over the transverse processes in all cases. In some tenderness over the anterior surface of the bodies of the vertebræ could be elicited by deep abdominal palpation.

The spine in the affected region was stiff and spinal muscles were rigid in practically all cases. In some scoliosis was present, in others the normal lumbar lordosis was lost, and in a small percentage a vertebral prominence or definite kyphosis developed in the later stages. In but very few cases was there local swelling or redness. In only three or four cases did the disease result in suppuration requiring incision and drainage.

At the present day the X-ray in the later stages of the disease affords the best proof of the existence of a local spine lesion. In this connection I cannot commend too highly the method, which is not in general use, employed by Dr. Henry K. Pancoast of taking

lateral views of the spine to bring out details unobtainable by the usual anteroposterior exposures.

Referred Symptoms.—Aside from the purely local pain in the spine the great majority of typhoid patients experienced severe or even excruciating pains radiating in one or more directions, as around one or both sides of the lower chest or abdomen, down one or both lower extremities, and into the testis. The referred pains were usually intermittent in character and very often were most violent and persistent at night, requiring opiates to procure sleep. The referred pains might persist from a few minutes to several hours at a time and then cease and recur after minutes or hours. These pains were commonly brought on or aggravated by any movement involving a strain on the spine, as turning in bed, lifting a leg, coughing, sneezing, etc. In a few cases the hot-water bottle was efficacious in controlling the pains. Complete fixation of the spine by a body plaster cast, spinal brace or extension apparatus usually gave prompt and marked relief.

Quite frequently tenderness was present over the same areas as the pain radiations. Occasionally muscular rigidity of an intensity which varied on different days, or even at different hours of the same day, was encountered in those cases in which pain was referred to the abdomen.

A few cases of typhoid spine have exhibited a curious rhythmical alternating contraction and relaxation of the abdominal muscles on one or both sides. These contractions usually have been synchronous with the pulse beat, and in one reported case they could be abolished by compression of the upper abdominal aorta. The contractions have arisen spontaneously with the patient at complete rest in bed, or have been started up by movements affecting the spine. They would occur rhythmically for a few moments up to three or four hours, and cease only to recur later. The individual contractions have been mild at one time and violent at another, or might start mildly and become vigorous, giving rise to discomfort varying from slight annoyance to great distress, and leaving the muscles sore, as if violently over-exercised, after the contractions cease. The contractions have occurred at intervals during which the referred pains might be either present or absent. The contractions as well as referred pain might be present on one side of the abdomen at a certain stage of the disease and on the other side at another stage. Rhythmical contractions of abdominal muscles were present in two of my patients. In one reported case muscular twitching of the thigh was noted.

The patellar reflex was increased in the majority of instances in

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which it is mentioned, was normal in a few, and rarely was diminished. Ankle-clonus was observed in several cases and Kernig's sign rarely. Hyperæsthesia or paræsthesia of areas on back, abdomen or lower extremities was noted in several cases and not found in others. Muscular atrophy sufficient to indicate nerve lesion occurred infrequently.

Diagnosis.—The diagnosis of typhoid spine usually should not be difficult. The existence or recent history of typhoid fever, the characteristic localized acute spinal symptoms, the suggestive referred symptoms, the constitutional disturbances, and later the X-ray findings afford an unmistakable picture in the typical cases. Difficulty as to the diagnosis, however, may arise under certain circumstances. Not all pains in the back of typhoid patients are due to typhoid spine. Doubt may arise as to whether or not early symptoms in a given case are due to the gradual onset of a typhoid spine or due to some of the more common but less serious forms of backache. Continued observation and study of the further course of the affection will soon disclose the correct answer to the question.

In cases of acute onset with predominance of the referred symptoms, the local symptoms in the spine itself may easily escape observation, unless the possibility of typhoid spine is kept in mind and these local signs are sought for. If the possibility of a spine lesion is not given proper consideration then various erroneous diagnoses may be made. The constitutional symptoms of fever, pulse-hurry and leucocytosis, plus the referred symptoms of pain, tenderness and rigidity of sudden onset present a fairly complete picture of any of the forms of intra-abdominal inflammation or suppuration.

The particular lesion which the typhoid spine will simulate under such circumstances is dependent on the abdominal region to which the symptoms of pain, tenderness and rigidity are referred. In such circumstances, however, it may be found that some special symptom of the disease under consideration is wanting, that the local signs are a little too diffuse or that there are other inconsistencies in the picture or course of the affection viewed as a whole. But even then the picture so closely simulates the conditions for which immediate operation is indicated that, unless the possibility of spinal lesion is considered, the patient is apt to be subjected to a needless laparotomy.

Again, the presence of mild spinal symptoms may be recognized and yet the constitutional disturbance plus the referred symptoms and their location be so very characteristic of an intra-abdominal lesion that two erroneous possibilities present themselves—either that a spinal and an abdominal lesion exist independently of one another or that an

abdominal suppuration occurred first and the spinal symptoms arose secondary to a toxæmia, metastasis or direct extension from a retro-peritoneal infection. If the diagnosis is uncertain under such circumstances it will usually be wise for the surgeon to delay operation until reasonably certain of the situation. The X-ray cannot be depended upon when the early pictures are negative, as it may require weeks for bone changes to develop to the extent that they can be shown by skiagraphs.

Prognosis as to life seems entirely favorable as none of the patients died of the typhoid spine lesion. Suppuration to the extent of requiring evacuation has been very rare. It is possible that small foci of pus might form and be absorbed. Absorption of one intervertebral disc with osseous ankylosis of the two adjacent vertebræ may be expected. Occasionally changes of the same type have involved more than two vertebræ. Kyphosis may or may not develop, or, as pointed out by Silver, may be present and obscured by heavy overlying muscles. By proper support of the spine until ankylosis occurs kyphosis can be prevented. A relapse to the extent of return of pain and tenderness is not uncommon during the subsiding stage from too early resumption of activity, but, unlike inflammatory spinal affections, typhoid spine, once arrested, does not tend to recur. Symptoms disappear in a few weeks or months, as a rule, but in Brownlee's case they persisted for 21 months. The ultimate functional result is usually perfect. If only two vertebræ are ankylosed the adjacent joints apparently are able to compensate for the lost mobility.

Treatment.—The best form of treatment is mechanical. The spine should be placed at as near absolute rest as possible. This may be accomplished by either plaster-of-Paris cast, spinal brace, or by continuous traction from head and feet. Pain often has ceased abruptly after fixation of the spine. Excessive pain can be relieved by the local application of heat, by aspirin or sedatives, but often opiates will be needed. Elimination should be pushed to combat the toxæmia. In prolonged cases vaccines may be of service.

CASE I.—M. B. M., male, aged fifteen years. Patient of Dr. T. H. Mackenzie of Trenton, N. J. After a week of prodromal symptoms patient went to bed the day following Thanksgiving, 1907. High fever, up to 104° F., for two weeks, constipation, tympanitis and rose spots. Three or four days after first getting out of bed in February, 1908, was hit with a severe pain in the back and along the right sciatic nerve. Following day pain shifted from right to the left sciatic nerve distribution and continued there

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for one month, when it stopped and pain shifted back to right sciatic for the next month. During all this time remained in bed. Had pain in lower back, made worse by movements.

Through the kindness of Dr. George H. Parker and Dr. Mackenzie I saw the patient at his home in April, 1908, at which time he complained of pain in the back and in the right sciatic distribution, both of which were aggravated by spinal movements. Right sciatic nerve was tender to the touch. Normal lumbar curve was lost. Spine was rigid. Tenderness most marked in mid-lumbar region. Made a diagnosis of typhoid spine. A plaster cast was applied by suspension method the following day, with 50 per cent. betterment in the pain within the next few days, and at end of two weeks pain had almost completely left. By end of third week cast had softened and was removed. Pain recurred in mild form. Cast reapplied for another three weeks, after which patient got up from bed and gradually resumed his activities.

His only skiagrams were taken on December 3, 1914, nearly seven years after the onset of his typhoid spine. X-rays show complete absorption of the disc between the second and third lumbar vertebrae with ankylosis between these two vertebrae. There is a slight kyphosis in this region.

He still continues to have occasional pain in form of backache, never severe and never interferes with whatever he is doing.

CASE II.—J. M. A., male, twenty years of age. Painter by occupation. Indulges freely in athletic sports, musculature well developed. Normal weight 138 pounds. Height 5 feet 6 inches. Previous medical history negative. Had mild attack of typhoid fever beginning October 6, 1907. Normal course till November 1, when he developed right femoral phlebitis. Christmas day sat up out of bed for first time. Gradual resumption of activity. During the last week of January, 1908, fell on ice while skating, but experienced no ill effects at the time. On the following day experienced a sudden severe pain in the back on attempting to rise from a stooping position. Pain continued in less severe form till February 3, when it extended to the right side of the abdomen. The patient was then confined to bed and treated for lumbago. About this time there was an almost total suppression of urine. Only three ounces of urine were obtained by catheterization after a period of 20 hours. Urine highly acid, specific gravity 1028, no sugar, no albumen. Complained of slight headache and aching pain in the back of neck. Mind slightly confused and later muttering delirium. The temperature taken infrequently was subnormal until February 16, when it was 102.4° F. Thereafter was subnormal mornings and elevated in afternoons, but gradually subsiding

for next eight days, after which it remained normal and sub-normal. Profuse sweating occurred during febrile period.

On February 10, patient began to have what he described as rhythmic "pulsations of the abdomen." These pulsations were slight at first and had a duration of only five or ten minutes, later on becoming more violent and persisting without intermission for hours.

The patient was examined at this stage by his brother, a physician, who observed that all of the abdominal muscles participated in violent, painful rhythmic contraction and relaxation, always at the rate of 104 or 106 to the minute, and not synchronous with the pulse. These convulsive abdominal movements would persist for upwards of six hours at a time and then cease, but on patient getting out of bed would recur in all their intensity, and were accompanied by pain at each contraction. The only relief obtainable was by having some one stand over him and press down heavily with flat hands on his abdomen. The contractions were so forcible that they almost lifted the entire weight of his heavy brother. The manual pressure would not cause contractions to cease but made them bearable. After contractions had ceased any attempt to relieve pressure immediately was followed by recurrence of contractions, but after waiting a few minutes pressure could be gradually released without recurrence.

The brother came to Philadelphia February 21, seeking advice, and the diagnosis of typhoid spine was suggested to him. He returned to the patient with the expectation of applying a plaster cast and bringing him to this city. On the night of February 21, the muscular spasms were the most violent they had been at any time and persisted without remission all night long, then ceased abruptly and patient slept continuously for 36 hours thereafter and remained drowsy and stupid for several days without contractions or pain. On March 6, following a trip to the toilet, mild contractions and pain recurred for a few minutes. It was noted that the normal lumbar lordosis was lost and that spine was straight for 14 inches.

On March 10 there were noted feeble contractions on the left side with pain and a "sore spot" in left iliac region.

On March 12, 1908, he entered the University of Pennsylvania Hospital. He was 20 pounds under weight. Complained of slight pain in left flank when he began to move about, but pain ceased on further movements. Abdomen was slightly rigid anteriorly and laterally on left side; some rigidity of spine and loss of normal lumbar curve but no kyphosis. There was a point of tenderness on deep pressure posteriorly at the side of the last dorsal vertebra. Reflexes normal.

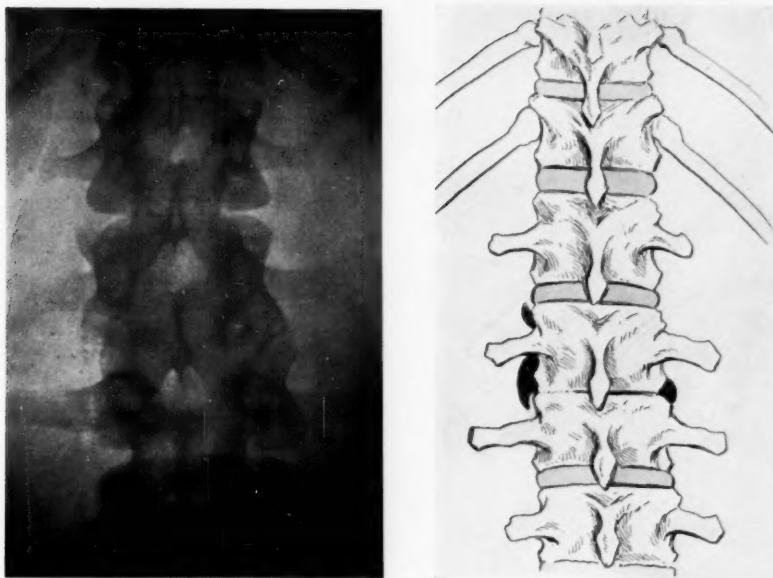


FIG. 1.—Skiagraph and diagram of anteroposterior view of Case I, taken seven years after onset of typhoid spine symptoms.

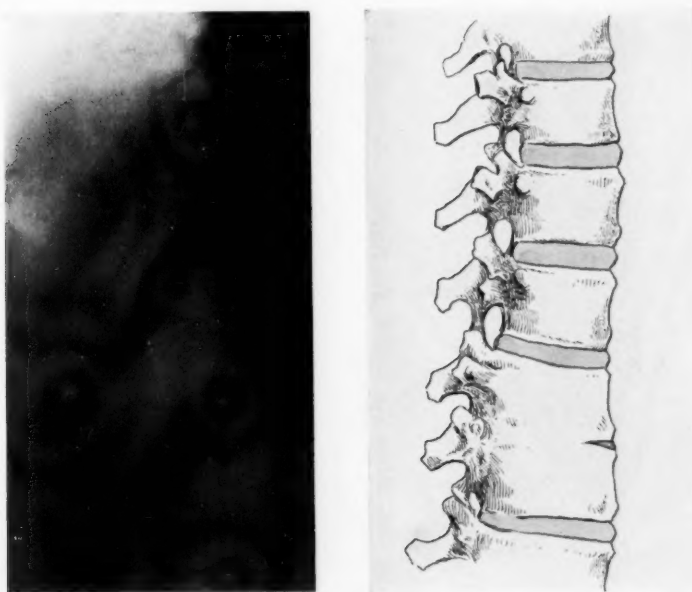


FIG. 2.—Skiagraph and diagram of lateral view of Case I.

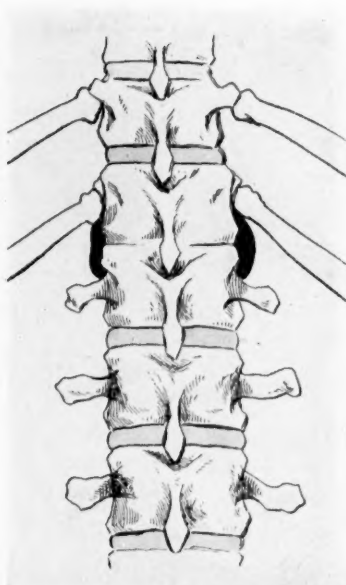


FIG. 3.—Skiagraph and diagram of anteroposterior view of Case II, taken seven years after onset of symptoms.

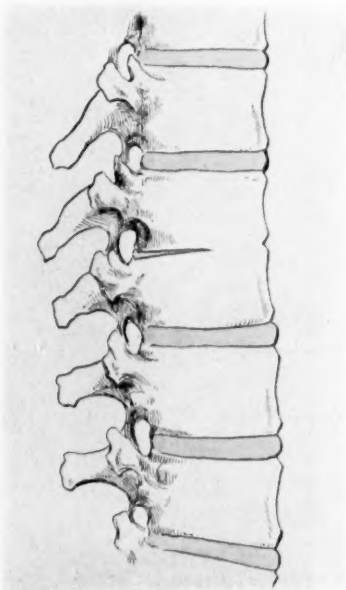


FIG. 4.—Skiagraph and diagram of lateral view of Case II.

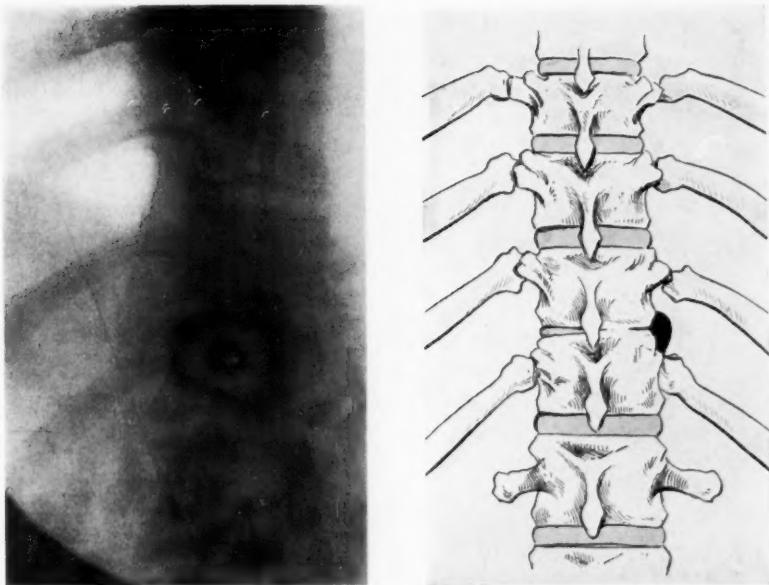


FIG. 5.—Skiagraph and diagram of anteroposterior view of Case III, six months after onset of symptoms.

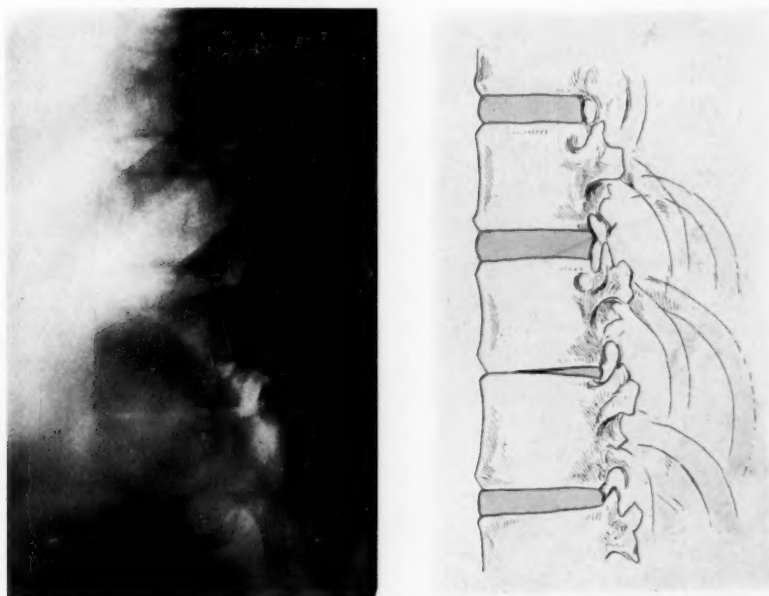
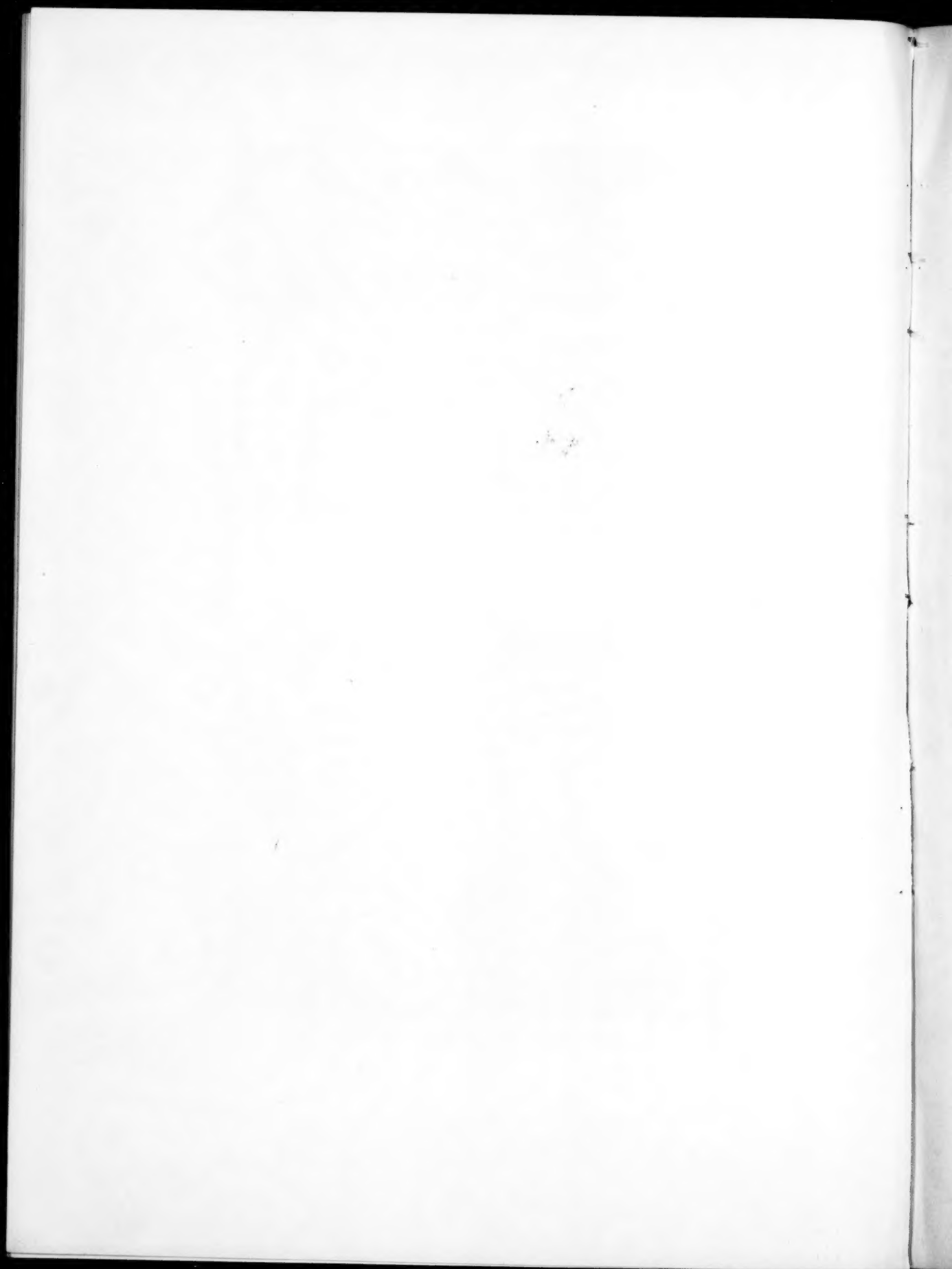


FIG. 6.—Skiagraph and diagram of lateral view of Case III.



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Skiagrams taken on March 15 disclosed a small area of osteoporosis of last thoracic vertebra and small amount of bone proliferation on the left side of body of same vertebra. X-ray pictures of the spine in those days were not very clear cut and the exact details of lesion were uncertain. Patient left hospital the following day without notice.

I next saw him November 26, 1914. He stated that he had no further trouble after leaving the hospital and was soon able to get about freely and in a couple of months returned to his occupation of painting railroad cars.

In the fall of 1908 he practised cross-country running of 7 and 8 miles daily with fellow-members of a club, and the same fall, and yearly since then, has played regularly on a foot-ball team. Although a small-sized man he is able to lift a 100-pound weight above his head with one hand. He has not experienced any difficulty whatsoever from his spinal lesion.

On examination his spine has normal outlines, is supple, and gives no evidence of kyphosis. The X-ray, however, November 26, shows complete absorption of the intervertebral disc between the last thoracic and first lumbar vertebrae, with approximation of these two vertebrae and complete bony union along their lateral ligaments.

CASE III.—J. W. C., male, aged twenty-nine. Professional base-ball pitcher. Four years ago mild catarrhal jaundice for ten days. Eight months ago mild attack of pleurisy, uncertain as to which side of chest. Venereal history negative.

March 20 to 24, 1913, violent gastro-intestinal disturbance, at Birmingham, Alabama, following ingestion of tainted food, with gradual recovery.

April 10, 1913, while in Boston, began to feel generally miserable and developed fever; because of which he returned to Philadelphia, his home city. Widal reaction negative weekly for four weeks, and then positive, at which latter time rose spots first appeared and were numerous for few days, then disappeared; mild abdominal tympany. Spleen not palpably enlarged. Temperature up to 102° and 103° F.

On May 10 temperature, having been around 99° for four days, abruptly rose to 103° coincident with onset of pain and tenderness over gall-bladder; no jaundice. Fever continued at 101° to 103° for ten days, then gradually declined, but some soreness persisted over gall-bladder.

On June 10, sufficiently recovered to go to Atlantic City. June 25, went to Maine. Soreness still present in biliary region. Applied a fly blister, and soreness ceased. August 1, rejoined his

team in Philadelphia against his physician's advice, went on western trip and gradually resumed active exercise.

September 1, while swinging bat at a pitched ball, was seized with violent pain over the lower ribs on the right side. Rested for several minutes, then was able to bat balls to the infield, although it caused him considerable pain. After going to bed that night pain recurred with increased severity and he developed a temperature of 106° F. with delirium. Pain increased by deep breathing but no friction sounds audible. Strapping of chest gave marked relief. Was ordered general sponge baths and colonic irrigations. Following day temperature 104-105°, then returned to near the normal in five or six days. Pain located at right costovertebral angle continued in lessening severity, and was made worse by motion such as turning in bed; rigidity and tenderness of upper right abdomen. His symptoms were suggestive of possible diaphragmatic pleurisy, or of infection in gall-bladder, liver or kidney, or in subdiaphragmatic or perirenal regions.

I saw the patient for the first time on September 12. Temperature was then 99.6°, pulse 90, and respiration 20. He complained of pain in upper right abdomen. Pain was most severe at night, when it would persist for hours, preventing sleep, but would disappear during day while at complete rest in bed, only to reappear on motion, as getting out of bed or turning in bed, and had diffuse tenderness over upper right anterior and lateral abdomen and hepatic area. Most marked point of tenderness was at right costovertebral angle. Lungs and pleura showed no abnormalities; deep inspiration no longer painful; reflexes normal. On sitting up in bed pain was increased and he supported his weight by his hands in the way characteristic of acute spinal cases. Being asked to raise his hands said he could not do so, as back felt "too weak" to sit up unsupported. Spinal muscles were tense on both sides and the dorsolumbar spine was rigid. Tenderness over last dorsal and first lumbar vertebræ was slight in the median line but more marked over right transverse processes of same vertebræ. Reflexes were normal. On standing erect he supported his body weight by his hands placed on pelvis. On attempting to pick up an object from the floor he kept spine rigid and flexed the hips and knees in the same way as a case of acute Pott's disease. Downward pressure on head or shoulders evoked complaints of increased abdominal pain. He was returned to bed when it was observed that he had slight rhythmical alternating contraction and relaxation of his upper right abdominal muscles for the next two or three minutes, and pain was so aggravated by the various manipulations that it persisted in severe form for a full hour. Curiously enough the local pain in the spine was so

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trivial in comparison to the referred pain in the upper abdomen that it was only with extreme difficulty that this intelligent patient could be convinced that the trouble was in the spine and not within the abdomen. A diagnosis of typhoid spine was made and the patient was sent to the University of Pennsylvania Hospital. Radiographs of the spine taken the following day (September 13) and on September 14 and 16 failed to show any abnormalities. He was kept at rest in bed. Pain was most marked at night and apparently was relieved somewhat by a hot-water bottle. On September 16 a plaster cast was applied from axillæ to the hips without relief of pain. Aspirin and bromides had no effect. Morphia was required for sleep. Three days of the cast had no effect on the pain, and in response to the patient's urging it was removed to enable him to reapply the hot-water bottle which he would place over the lateral wall of the abdomen and chest rather than over the spine. The urine repeatedly exhibited a trace of albumen, many hyaline and granular casts, an occasional red blood-cell, and great excess of leucocytes, but by October 1 the red cells and excessive leucocytes had disappeared from the 24-hour specimen. Examination of the blood showed 4,470,000 red cells, 9900 leucocytes and 80 per cent. hæmoglobin. The differential count gave 56 per cent. polymorphonuclears, 31 per cent. lymphocytes, 7 per cent. large mononuclears, 4 per cent. transitionals, and 1 per cent. eosinophiles.

On repeated leucocyte counts the highest number obtained was 11,100 on October 3. Widal test (September 27) was positive; Wassermann (September 25) and Von Pirquet (October 1) tests were negative. Blood cultures (October 3) were sterile. From a culture of the fæces (October 1 and October 10) a paratyphoid organism and non-motile, rod-like bacteria of the *aërogenes* type were isolated. Urine was examined bacteriologically but report has been lost. Nothing very suggestive was found.

His temperature the first five days after admission to the hospital varied daily between 98° and 99°, then showed an upward trend and for twelve days ranged chiefly between 99° and 101°, going down occasionally to 97.6° and up to 102°. On October 1, the day extension was applied to head and neck, the temperature reached 102°. The following day it did not go above 99.6°, and thereafter continued lower, being entirely normal or subnormal during his last month in the hospital.

On September 20 and November 22, 1913, exhaustive general examinations from the neurological stand-point were made by Dr. Wm. G. Spiller. The only deviation from the normal he could discover was a diminution in the intensity and promptness of the

right upper abdominal (epigastric) reflex at the first examination, but this defect was barely noticeable at the second.

Beginning on September 17 and continued daily thereafter for two weeks, colonic irrigations of from two to three quarts of normal saline solution were employed at the suggestion of Dr. Alfred Stengel, who had observed following this treatment prompt cessation of symptoms in a number of similar post-typhoidal cases. The irrigations seemed especially appropriate in this case because of a year's long constipated tendency, but they had no beneficial effect on symptoms and were discontinued because the manipulations attending their administration and expulsion aggravated the pain. Thereafter the constipation was corrected by paraffin oil aided by various laxatives.

From the time the patient entered the hospital he continued to have intermittent pain and intermittent rhythmical spasms of the muscles on the right side of the abdomen. The pain and rhythmical spasms might occur together or independently of one another, and either or both would be excited by movements in bed. When either or both were present they might persist for a few minutes only, or for hours at a time. Pain was particularly severe for hours continuously almost every night, partially relieved by hot-water bottle, but sleep often not obtained by anything short of opiates. The rhythmical spasms were synchronous with the pulse, were observed chiefly on the right side, and then would pull linea alba to the right. After cessation of a long continuance of the spasms the muscles would be sore as after vigorous exercise in one unaccustomed to it. Adhesive strapping and tight circular bandaging of the abdomen, applied during times cast was off, somewhat relieved the distress of the rhythmic contractions but did not stop them. During the intervals free from rhythmic contractions the muscles of the upper right abdomen were more or less rigid. Efforts at deep palpation excited an increase in the rigidity.

On September 26, X-rays were negative. Plaster cast was applied that day, but with no relief, and was removed two days later. Cast reapplied morning of September 30, under different conditions from former ones, but pain being made worse it was removed in the evening of the same day. On October 1, obtained a longer bed for patient and applied extension to head and legs, which was continued until November 5. This was promptly followed by relief of pain and spasms, and after two days they both ceased entirely for several days. On October 15 X-rays were negative. About this time a recurrence of marked pain, tenderness and rigidity in upper right abdomen without muscle spasm again raised the serious question which had already been con-

TYPHOID SPINE

sidered frequently, as to whether or not there was an intra-abdominal or retroperitoneal abscess. The history of two previous attacks of biliary trouble, the preceding urinary findings, and the negative X-rays at this late stage of the spinal disease, all contributed to the difficulty of the situation. The right-sided symptoms, however, suddenly ceased and a day or two later mild pain, tenderness, rigidity and muscular spasms appeared on the left side for the first time. The left-sided symptoms were never severe and disappeared in a few days.

On November 5 was measured for a spinal brace, but to enable him to sit up in bed at once a plaster cast was applied. The cast proved uncomfortable and sitting up in it caused mild recurrence of right-sided pain and twitching, and it was removed on November 8. Thereafter no pain except when he turned in bed. November 15, the spinal brace applied. November 18, X-rays for first time demonstrated slight changes in the form of absorption and new bone deposit along the edges and sides of the bodies of the eleventh and twelfth thoracic vertebræ. On November 26, out of bed for first time, and on November 28 left the hospital, being then able to walk with difficulty, owing to muscular weakness. An X-ray taken December 17 showed narrowing of intervertebral space and more bone deposit. He continued to wear the spinal brace till February, 1914, when parts of it were removed, and a month later began leaving brace off part of each day, finally abandoning it altogether about May 15. In July he began light exercise and at end of August was given permission to go the limit in exercise. He was not able to regain his old-time form as a pitcher before the end of the season, but this seems more likely to have been due to his not having pitched for two seasons, during which he passed through two prolonged illnesses, rather than to any difficulty existent in the spine. He could pitch fast balls satisfactorily but did not have the usual control over his curves. As he described the situation, his pitching was of his usual calibre at the beginning of previous seasons, and with more practice he felt he would regain control as he had in previous years as the season progressed.

His last X-ray was taken on March 17, 1914, and shows absorption of the intervertebral disc with ankylosis of the eleventh and twelfth thoracic vertebræ. He had no kyphosis, no pain nor tenderness and no apparent limitation of spinal movement when last examined in August, 1914.

CASE IV.—J. H., male, thirty-seven years of age; Belgian; sailor. Admitted to service of Dr. Alfred Stengel at University of Pennsylvania Hospital on September 5, 1914. Had been ill for six days. On admission, tongue coated, spleen uncertainly palpa-

ble, considerable tympanites; temperature 102° F., pulse 124, hæmoglobin 60, red blood-cells 4,090,000, white blood-cells 4800, urine a trace of albumin, hyaline and granular casts. Widal positive two days later.

On September 20 had urticarial eruption on back and right arm which left the following day. By October 30 temperature practically normal.

On November 2 complained of pain in left iliac and left sacro-iliac regions. On November 4 sacro-iliac region was strapped with adhesive plaster. On following day it was noted strapping had not relieved pain; on November 8 was still complaining of some pain and there was some tenderness over left sacro-iliac joint.

On November 10 it was noted that pain and tenderness were not constant. On November 18 X-rays of spine, sacro-iliac joints and right hip negative. On November 20 pain variable. Patient refused to sit up though encouraged to do so.

On December 3, I first saw the patient by the invitation of Dr. Stengel, who has kindly permitted me to report this case from his service.

Patient is a Belgian, at present somewhat neurotic, and, by reason of his understanding English only imperfectly, it is rather difficult to obtain accurate information from him. He complains of pain in the lower back, right sacro-iliac region, right lower abdomen and right thigh. He presents distinct localized tenderness posteriorly over the middle and lateral aspects of the third lumbar vertebra and over the right sacro-iliac joint. Anteriorly there is no midline tenderness at or above the umbilicus on deep pressure. Below the umbilicus fairly deep pressure does not cause any distress, but on making firmer pressure so that the palpating fingers finally come in contact with the body of the third lumbar vertebra the patient cries out and squirms away from the examiner's hand.

The normal lumbar curve is lost and the lumbar spine is held rigidly. Efforts at forward or lateral flexion or hyperextension cause pain. The patient turns over or sits up in bed with difficulty because of increased pain. He apparently has ample strength to handle himself readily but on moving exhibits the awkwardness characteristic of patients having an acute spinal inflammation. On sitting up with his feet over the side of the bed he persists in supporting his weight by his hands placed on the mattress. Downward pressure on his head causes pain in the midlumbar region. His knee-jerks are present and equal on the two sides.

A second set of X-ray pictures were taken with negative results. On December 8 weight extension was applied to both legs and in 48 hours all of his pains were decidedly better. On

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December 9 daily colonic irrigations with normal salt solution were begun. On December 19, 1914, hæmoglobin 80 per cent., red blood-cells, 5,310,000, leucocytes 9000. Patient continued to improve. On January 2, 1915, leg extension discontinued because pain had practically disappeared, but remained in bed till January 19, when he was up in wheel chair for first time, and his fourth X-ray was negative. Sacro-iliac tenderness is gone. Lumbar spine still rigid. Lumbar curve still wanting. Has distinct tenderness over lateral aspects of third lumbar vertebra, but median tenderness nearly absent.

He is being skiagraphed each week both with expectation of showing bone changes ultimately in his lumbar spine and with intention of ascertaining at what stage organic changes sufficient to be shown by the X-ray take place.

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TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

*Stated Meeting, held at the New York Academy of Medicine,
December 9, 1914*

The President, DR. FREDERIC KAMMERER, in the Chair

DISLOCATION OF THE SEMILUNAR BONE

DR. JOHN DOUGLAS presented a man, twenty-six years old, who on October 19, 1914, fell from a platform twelve feet high, striking on the palm of his left hand and sustaining an anterior dislocation of the semilunar bone. There was not sufficient swelling to mask the characteristic deformity, a depression on the wrist dorsally from which the bone had been displaced, below which could be felt the prominent head of the os magnum, while on the anterior aspect of the wrist could be palpated the dislocated semilunar bone. Radiographic examination showed that the bone was dislocated anteriorly and twisted upon itself so that the concave distal surface faced the palmar surface of the wrist instead of the fingers.

The patient refused to take an anæsthetic, but reduction was easily accomplished by hyperextension of the hand by an assistant, while pressure was made with both thumbs on the dislocated bone anteriorly, followed by hyperflexion. At the present time, seven weeks after the injury, there was complete restoration of all function and motion in the joint.

This case was shown, Dr. Douglas said, not because dislocations of the semilunar were rare, the injury frequently being associated with fracture of the scaphoid, but because most cases had required an open operation for reduction or excision of the bone, usually because of delay in making the diagnosis. Codman and Chase, in their report of twelve cases in the ANNALS OF SURGERY (vol. xli, 1905, page 863), were obliged to resort to an open operation in all but two of their cases, although they state that reduction may be effected even after a period of five weeks. Also the necessity of open operation in most cases was shown by the reports on the subject in literature.

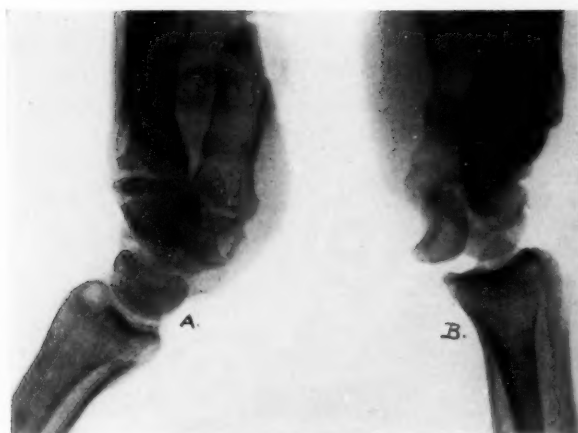
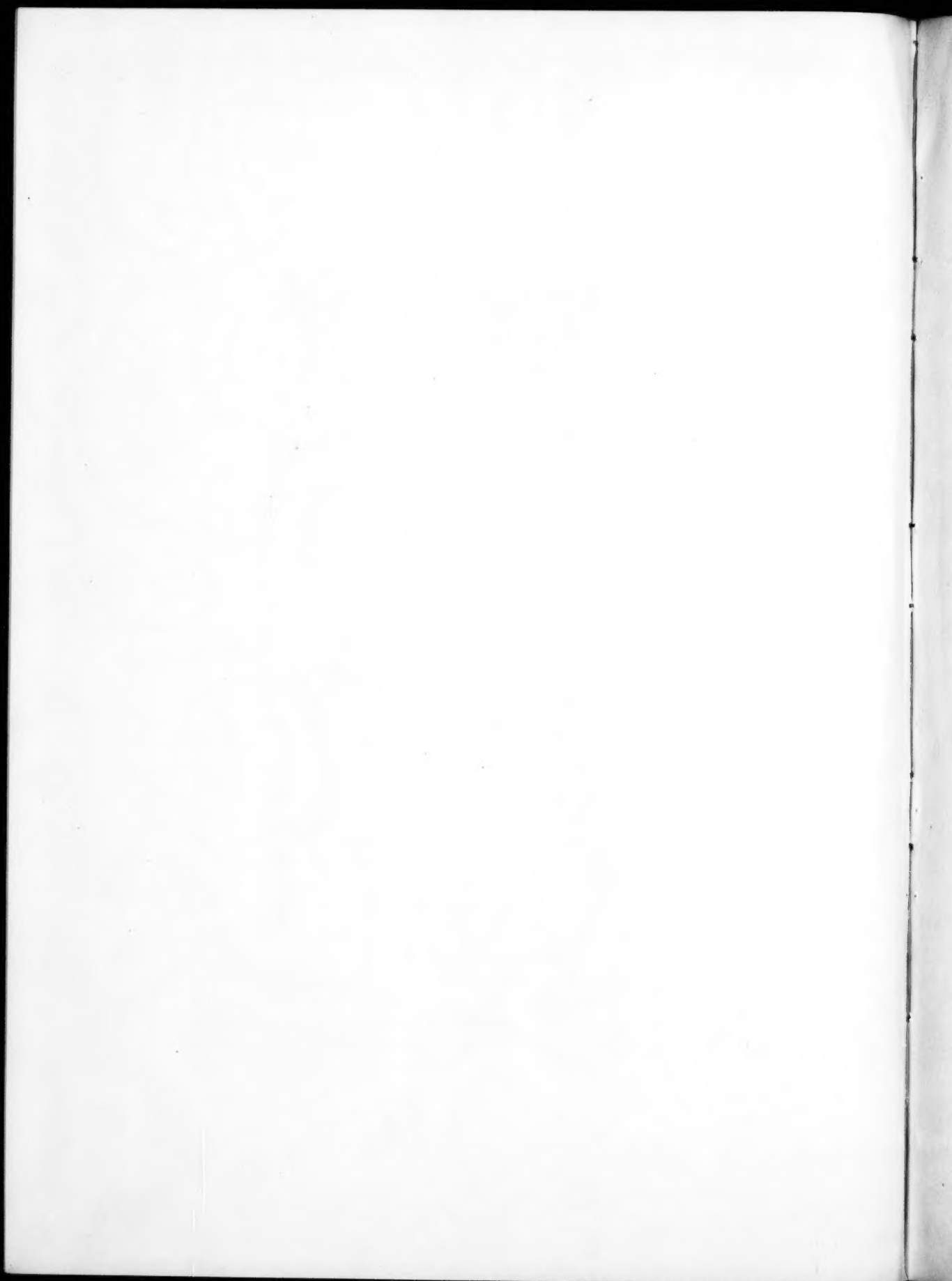


FIG. 1.—Dislocated semilunar bone. A. Uninjured wrist (for comparison). B. Injured wrist.



FIG. 2.—Condition after reduction. A. Uninjured wrist. B. Injured wrist.



COMPLETE EXCISION OF A TUBERCULAR URETER

COMPLETE EXCISION OF A TUBERCULAR URETER FOUR YEARS AFTER NEPHRECTOMY

DR. BENJAMIN T. TILTON presented a woman, thirty years old, who was subjected to a nephrectomy ten years ago, the left kidney being removed for tuberculosis of the kidney. Following this operation, a sinus persisted in the left loin for four years in spite of three subsequent operations undertaken to close it. On the supposition that the persistence of the fistula was caused by the stump of a tubercular ureter, it was decided to excise the entire ureter through an anterior incision. The usual "hockey-stick" incision was made and a very much thickened ureter was found and separated from the posterior surface of the peritoneum down to the entrance of the bladder, where it was ligated and the stump cauterized. The upper end was then freed, the sinus circumscribed by an oval incision, and the entire tract from the skin to the bladder removed in one piece. The patient made an uneventful recovery and the wound healed without further delay.

The specimen showed a dilated portion of the pelvis of the kidney and a ureter about the size of the adult finger. The persistence of the fistula was evidently due to the portion of the kidney pelvis that had been left behind. For this reason it seemed unfair to ascribe the fistula to the fact that the ureter had not been removed. The speaker said that in his experience it was sufficient to ligate the ureter well below the kidney in performing nephrectomy for tubercular kidney, and cauterize the stump. He had never seen a fistula result after such a procedure in spite of the ureter being left undisturbed.

DR. GEORGE E. BREWER said he could personally recall but a single instance where he was called upon to remove the remaining section of the ureter after a nephrectomy for tuberculosis of the kidney. It was his rule in these operations to make a rather long incision and cut off the ureter as low down as possible. He recalled a remark made by Dr. Willy Meyer at a meeting some years ago, that if we removed the principal focus of infection in these cases, nature would take care of the rest. The speaker said that in the case he had in mind the ureter was about the size of his finger, and he removed it as far down as the brim of the pelvis. A fistula developed, and at the second operation he found—not a tuberculous ureter, as he had expected—but a bit of crumpled catgut that had formed part of the ureteral ligature.

DR. ROBERT T. MORRIS said that much depended on the post-operative care of these patients. Personally, his experience was very much like that of Dr. Brewer, and after the removal of a tubercular kidney he usually left behind a good section of the ureter, on the principle that

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removal of a chief tubercular focus allowed nature to care for the remainder. The patient's general nutrition, etc., then required careful supervision, as in dealing with tuberculosis elsewhere in the body. In some of his cases he had removed the entire ureter by Dr. Lilienthal's method, which he considered a very excellent one.

AN UNUSUAL CASE OF HYDRONEPHROSIS

DR. ELLSWORTH ELIOT presented a woman, forty-three years old, who was admitted to the Presbyterian Hospital on October 2, 1914, and who complained of sudden attacks of sharp, stabbing pain in the right, upper quadrant of the abdomen, persisting for two or three days and then subsiding quickly, leaving a soreness of the right flank. These attacks were not associated with chills, fever, headache, nausea nor vomiting. The first attack occurred ten years ago, and came on suddenly while the patient was stooping; since then the attacks had recurred at intervals of from one to five months, and she had had two attacks since January, 1914, the last one being more severe than the others and confining her to bed for ten days. The pain, which was sudden, usually came on during some bodily exertion and was localized on the right side of the abdomen. It was aggravated by bending forward, and was eased by lying quietly in bed with hot applications to the side. It usually subsided quickly.

The patient's urination during the course of these attacks showed no change. She usually voided urine three or four times daily and gave no history of the sudden passage of large quantities of urine nor burning during the act of micturition. The urine was of normal amber color, acid, with a specific gravity of 1020; it was free from albumin and contained a few epithelial and white blood-cells. The patient's menstrual history was negative. She showed a tendency to constipation.

Cystoscopy (by Dr. A. T. Osgood): The bladder held 300 c.c. without pain. The vesical mucous membrane was normal in appearance. The right ureteral orifice was small and catheterized with difficulty and the catheter was obstructed 20 cm. from the ureteral orifice. No urine was secreted from this side during the fifteen minutes that it was observed. The left ureter was secreting normally.

At the time of the patient's admission to the hospital examination revealed a tumor the size of a football extending from the free costal margin on the right side down into the iliac fossa. It was smooth, oval and elastic, readily palpable, with a slight depression near its upper limit.

NEPHROLITHIASIS

The case was regarded as one of hydronephrosis, and on October 5, Dr. Eliot made the usual lumbar incision on the right side, and found the peritoneum extending laterally in the region usually occupied by the kidney. As far as the bodies of the vertebræ no kidney could be felt, and the upper part of the mass, on opening the peritoneum, was found to be a large projecting lobe of the liver. Through this opening the gall-bladder was explored, showing no evidence of cholelithiasis. The peritoneum closed, incision was extended downward and forward, and at the crest of the ilium the upper limit of the hydronephrotic sac was encountered. Its sac was closely adherent to the perirenal tissue, and at one point it was so thin that it ruptured during the manipulations.

The entire cyst, together with the kidney, was removed, and the wound closed with a cigarette drain.

The two interesting features of the case were, first, the fact that the hydronephrosis was associated with a Riedel's lobe of the liver, which obscured the diagnosis; second, the question as to whether the hydronephrosis involved a displaced kidney or a dystopia (unascended) of the kidney: The fact that the renal vessels ran downward and forward from their normal origin in the aorta indicated that the kidney had been displaced downward and that it was not a true case of *dystopia renalis*, in which the renal artery usually rises from the lower aorta or common iliac trunk.

The patient made a satisfactory recovery from the operation and had been free from symptoms since.

NEPHROLITHIASIS

DR. ELIOT presented an Italian boy, nine years old, who was admitted to the Presbyterian Hospital on November 9, 1914, with the history that for the past six months he had suffered from daily attacks of general abdominal pain, sharp and sudden in onset, lasting from twenty minutes to one hour and becoming localized in the hypogastric region. At times, these attacks were associated with hæmaturia and followed by nausea, vomiting, chills and fever. The attacks usually came on during the act of micturition, the pain being cramp-like and so severe that it doubled the patient up. At times the pain occurred when he made a sudden movement and it was often quickly relieved by lying on his stomach. The last attack had occurred about one month ago. He gave a history of four severe attacks of hæmaturia, passing a large amount of bright red blood which left a heavy sediment in the vessel. The passage of blood did not increase nor lessen the pain.

Past history: It was learned, on inquiry, that the boy had suffered

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from frequent nose bleeds and that he bled freely when cut. His mother, uncle, grandfather and half-sister also bled easily.

On admission, the patient's temperature was 98.2° ; pulse 96; respirations 22. A blood count showed 15,200 white cells, with 71 per cent. of polynuclears. The blood began to coagulate in 3.5 minutes and coagulation was completed in 11 minutes. The urine was acid, with a specific gravity of 1028; it was free from albumin and red blood-cells. The Wassermann was negative. The X-ray showed a calculus in the left kidney pelvis.

Through a lumbar incision the left kidney was exposed and enucleated, and upon dividing the posterior wall of the pelvis, the calculus was readily found and evacuated. The wound was then closed with ordinary catgut and a cigarette drain left in for 36 hours. For seven days after the operation, the temperature ran the usual course, and then suddenly went up to 104° . It remained irregularly high for five days and then quickly fell to normal and remained so. During this period there were no evidences of wound infection, but a steady discharge of considerable quantities of blood in the urine. Coincident with the drop in the temperature the hæmaturia ceased and has not recurred since. At the time of the operation no damage had been done to the kidney, and the posterior wall of the renal pelvis was divided and sutured without hemorrhage. The case is presented as one in which the post-operative hæmaturia with the associated temperature might be ascribed to a hæmophilic diathesis.

The calculus which was removed from the kidney pelvis was about the size of a walnut and was composed of uric acid, calcium urate, and calcium oxalate.

INTUSSUSCEPTION IN A CHILD

DR. ELIOT presented a boy, seven years old, who was admitted to the Presbyterian Hospital on October 12, 1914, with the history that at six o'clock on the morning of that day he was seized with a sudden, severe, cramp-like pain on the right side of the abdomen, with vomiting and obstipation. The vomiting recurred four times, the vomitus being fluid in character, bitter, without foul odor. There had been normal bowel movements up to the onset of the pain, the last one having occurred on the previous afternoon; since then there had been no passage of fecal matter nor flatus. He had never passed any blood.

The pain gradually subsided, leaving a sense of soreness in the right lower quadrant, which was eased by lying on the stomach or on the right side with the knees flexed, and was increased by body move-

GASTROPTOSIS WITH PERSISTENT VOMITING

ments. On admission, the boy's temperature was 100.8°; pulse 124; respirations 32. A blood count showed 22,600 white cells, with 91 per cent. of polynuclears.

When Dr. Eliot saw the patient he was lying sleeping without anodyne on his right side with his knees flexed, and apparently free from pain. Changing his position from the right to the left side gave rise to pain. In the right lower quadrant there was a mass which, together with the increased leucocytosis, gave rise to the suspicion of an appendicular abscess. The possibility of an intussusception was considered, but discarded. A gridiron incision was made, and upon exposing the peritoneal cavity a good-sized irreducible intussusception was found. It was limited to the lower part of the small intestine, with its apex within an inch or two of the cæcum. The gut was resected and an end-to-end anastomosis was done. The patient left the hospital on the thirteenth day.

The specimen showed necrosis of the inner sheath. An inverted Meckel's diverticulum had formed the apex of the intussusception.

Dr. Eliot said that several years ago he had collated all the reported cases of this particular variety of intussusception, and in every instance the clinical symptoms were very severe, and most of the patients succumbed. In the case he reported to-night both the subjective and objective symptoms were very mild. The former in the infrequency of the vomiting, the freedom from severe and constant pain, the fact that sleep was possible without a narcotic, and that movement of the body could easily be carried out without marked discomfort to the patient. The latter in the complete absence of muscular rigidity and of marked tenderness over the tumor, which was larger and more oval than the tumor usually observed in enteric intussusception.

The absence of mucus and blood in the stools is the rule rather than the exception in intussusception above the ileo-cæcal valve. In the present case there was no sign of blood whatsoever in the intestine below the apex of the intussusception.

GASTROPTOSIS WITH PERSISTENT VOMITING

DR. WILLIAM A. DOWNES said that in presenting this case he wished to call attention to the fact that simple ligature of the pylorus was some times followed by permanent closure and to invite discussion on the subject of gastroptosis. The patient was a girl of twenty who was admitted to the medical service of St. Luke's Hospital, on July 18, 1912, with a diagnosis of catarrhal jaundice, for which she was given the usual medical treatment, and she was discharged on September 6, improved.

She was readmitted to the surgical service of the hospital on April 5, 1913, complaining of vomiting after meals and with the history that since her discharge from the medical service she had suffered from epigastric pain which radiated to the left shoulder and was relieved by vomiting. There was no blood in the vomitus or stool. At this time the patient was slightly jaundiced, and an X-ray examination showed a marked degree of gastric ptosis, with considerable retention of food at the end of six hours.

On April 9, 1913, an exploration was made through an upper right rectus incision with negative result in so far as the presence of ulcer or gall-stones was concerned. The stomach and colon were elevated and fixed somewhat after the Coffey method, and the patient was discharged, improved, on May 24.

She was readmitted to the surgical service on June 25, and assigned to Dr. Downes, with symptoms similar to those complained of at the time of her previous admission. Since her discharge about one month ago she had lost considerable weight and had suffered from almost persistent vomiting, together with epigastric pain and marked constipation. Medical treatment and lavage had been tried without benefit. An X-ray examination at this time showed the stomach to be in the same position as it was previous to the gastropexy, with marked retention at the end of six hours.

On June 27, 1913, a second operation was done. The stomach was found to be markedly dilated and the pylorus was slightly thickened, but would admit the tip of the finger. With the exception of a few adhesions, there was no evidence of the previous operation. A posterior gastro-enterostomy was done and the pylorus was occluded by means of a heavy linen ligature: a few interrupted sutures were taken to unite the peritoneum across the groove formed by the ligature.

After this operation the vomiting ceased immediately and the patient made a good operative recovery. An X-ray examination, made a fortnight later, gave evidence that the food was passing rapidly through the stoma and that none of the bismuth was passing through the pylorus. The stomach emptied itself at the end of five hours.

On February 17, 1914, the patient was again admitted to the hospital with the history of regurgitation. However, she had gained some ten or twelve pounds in weight and was in better health than she had been for a long time. At this time she complained of pain in the left hypochondrium and said that the vomitus was greenish in color and usually occurred before breakfast. An X-ray examination showed that the stomach was emptying itself in about the normal time through

TWO-STAGE PYLORECTOMY FOR ULCER

the gastro-enterostomy opening, no bismuth passing through the occluded pylorus. After considerable deliberation an exploration was decided upon. The anastomosis was found to be in good condition; both branches of the intestine were normal in appearance and there was no distention of the proximal loop. However, it seemed reasonable to do an entero-anastomosis. The proximal limb of the jejunum was too short to allow sutures to be used without considerable difficulty: therefore, an anastomosis was made with a Murphy button, the halves being introduced into each limb of the gut through an incision in the anterior wall of the stomach. An examination of the pylorus both externally and through the stomach incision showed the occlusion to be absolutely perfect; this was eight months after the ligature had been placed around it.

The patient made an uneventful operative recovery and remained free from vomiting until about a month ago; since then the regurgitation had recurred to a moderate extent. Still, her general health was much better and her gain in weight had continued. *An X-ray examination made in November, 1914, seventeen months after the occlusion of the pylorus, showed that the latter still remained closed and that all the bismuth passed through the gastro-enterostomy stoma.*

CASES OF TWO-STAGE PYLORECTOMY FOR ULCER

DR. HOWARD LILIENTHAL presented two patients upon whom he had done pylorotomy in two stages in order to illustrate the importance of removing the pylorus in cases of ulcer in the pyloric area, whether on the gastric or duodenal side. The wisdom of this procedure had been impressed upon him by his observation of two cases in which the pylorus had been left behind after a gastro-enterostomy in one instance and a Finney's operation in another. It subsequently became the site of malignant disease several years after the primary operation; in one of the cases four or five years had elapsed. He believed, with Rodman, that the safest thing to do was to get rid of the ulcer-bearing area—not simply tying it off, but taking it out altogether. The operation should preferably be done in two stages, and the technic he employed was as follows:

When he was fairly certain of his diagnosis, he made his primary incision to the left of the umbilicus and completed the first stage of the operation—the gastrojejunostomy. Then, after an interval of four weeks, during the course of which the hospital patient may even be allowed to go home, the second stage of the operation is done through an incision directly over the disease and the pylorus can usually

be removed at this time with much less difficulty than it could have been at the primary operation. There are no adhesions, the health of the patient has usually improved, and frequently pathological conditions that were met with at the first operation have disappeared, but a pylorotomy should be done nevertheless.

GASTROSTOMY AND INFERIOR ŒSOPHAGOPLASTY
(BECK-JIANU)

DR. WILLY MEYER presented an Italian woman, twenty-seven years old, who five months ago began to experience difficulty in swallowing, and examination revealed an Œsophageal obstruction 22 cm. from the teeth-line. This was also shown by the X-ray. A small piece of the growth was removed by Œsophagoscopy, and pathological examination proved it to be malignant.

The youth of the patient in this case, Dr. Meyer said, prompted him to attempt a radical operation with additional Œsophagoplasty. He made an incision through the rectus muscle as close to the median line as possible, and as the stomach proved to be fairly large, he did the typical Beck-Jianu operation. After ligation of part of the omentum, the major curvature of the stomach was exposed to within about an inch and a half of the pylorus. The stomach was then drawn forward and incised parallel with the greater curvature. Huelst's stitching instrument was used. After division a running suture was placed on top. He now had a tube made from the lower part of the stomach, which was 22 cm. long. With the stomach turned and the tubes drawn upward, the upper end of this lower portion of the new Œsophagus reached to the clavicle. It passed upward through a subcutaneous tunnel. In making this tube, care should be taken to make the communication with the cardiac end of the stomach small; otherwise, regurgitation might occur. Another precaution was to cauterize the superficially situated branches of the pneumogastric nerves at the base of the new tube, anteriorly as well as posteriorly.

Dr. Meyer said he hoped to do a second operation on this patient, when he would attack the Œsophagus, excising the cancerous section and reforming a new Œsophagus, antethoracically, by means of the proximal portion of the divided Œsophagus and the new tube of stomach tissue that was now at his disposal. If he found himself unable to do a radical operation, he would try to divide the Œsophagus just above the aortic arch and bring its proximal end in connection with the upper end of the Beck-Jianu tube. This would permit the woman to again chew and swallow food, that means eat and drink, which was the one great desire of these patients.

MESENTERIC CYST

DUODENAL ULCER: GASTRO-ENTEROSTOMY: PYLORIC EXCLUSION

DR. MEYER presented a man, sixty-three years old, who came under his observation in the latter part of March, 1914, with the history that he had suddenly vomited large quantities of blood. He was removed to the hospital, and after a course of rectal and later duodenal feeding his condition improved sufficiently to permit of operation. All tests made pointed to pyloric or duodenal ulcer. On April 8, Dr. Meyer opened the abdomen and found on the distal side of the pylorus a distinct infiltrated area. There was a series of adhesions between the posterior wall of the stomach and the transverse colon: these were released, and after removing the appendix, which the speaker said he strongly favored in all these cases, he did a posterior gastro-enterostomy and excluded the pylorus by the silk-thread method. By making our way posterior to the stomach, we are able to pass a pretty strong silk suture, and then, by infolding the anterior gastric wall this can be drawn sufficiently tight to exclude the pylorus without unduly constricting the tissues. The patient made an uneventful recovery and is now enjoying excellent health.

What shall we do, Dr. Meyer asked, in those cases where we have had severe hemorrhages from the stomach, without, perhaps, any tangible evidence of an ulcer on inspection and palpation during operation? In spite of the lack of such evidence the speaker said he was in favor of doing a posterior gastro-enterostomy and exclusion of the pylorus with appendectomy in cases where the laboratory and X-ray tests and the other methods now at our disposal for establishing the diagnosis of *ulcer near or at the pylorus* pointed to the presence of such an ulcer.

MESENTERIC CYST

DR. CHARLES N. DOWD presented a boy of seven years who was admitted to the Roosevelt Hospital on October 20, 1914. He had been in fairly good health until last summer, when he began to complain of an intermittent, dull pain in the abdomen, which was not colicky in character at any time. There was no history of constipation, but he had lost five pounds in weight since September 6. His parents stated that during the past two years he had not been as strong as formerly. Recently, on two occasions, he had vomited.

On examination, a mass, the size of an adult fist, could be felt in the lower part of the abdomen. It usually lay below and to the right of the umbilicus but could be displaced upward to the right costal border and over to the left lower quadrant. It had a globular feel and was not tender.

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On October 21 the mass was removed through a median incision. It was about three and a half inches in diameter and contained a large lobule which was sacculated and held five or six ounces of chylous fluid. There was also a smaller lobule containing clear serum. The cyst seemed to push forward from the root of the mesentery near the spine, and in this portion it contained fatty, fibrous and lymphatic tissue. The cyst wall was examined by Dr. Baldwin Mann: It was found to be composed of fibrous tissue and showed no evidence of epithelium or endothelium on its inner surface. It seemed flattened out by pressure. The fluid from the cyst was examined by Dr. J. Greenwald of The Harriman Research Laboratory. It contained protein (calculated for nitrogen) 4.4 per cent.; fat 31.8 per cent.; and apparently chyle. The cyst was situated between the layers of the mesentery of the small intestine and had pressed on the intestine, so that it could not be removed without cutting some of the vessels at the mesenteric border. The patient made a good recovery, leaving the hospital twelve days after the operation.

Dr. Dowd said this case was shown to illustrate a point which was called to the attention of the Society several years ago: It had been stated that these mesenteric cysts were caused by an occlusion of the lacteals, but there seemed no reason to believe that there was pressure enough to cause such a cyst formation even if the lacteals were obstructed. On the other hand, there was every reason to believe that these cysts came from some tissue which had the power of independent growth. The fact that in this case one lobule was filled with clear serous fluid and the other with chylous fluid was good evidence that the cyst formation did not come from occlusion of the lacteals, but rather from aberrant growth of some tissue, probably of embryonic origin. It was very important that the fluid content and the walls of these cysts should be examined whenever there was an opportunity.

SEPTIC MENINGITIS

DR. DOWD presented a girl, twelve years old, who entered St. Mary's Hospital for Children on November 16, 1913, with discharging sinuses in her scalp leading down to necrotic areas in an osteoplastic skull flap. This flap had been raised in another hospital four months previously for the extraction of a bullet which had penetrated the left orbit and lodged in the right motor area.

As the necrotic spots in the bone were small and the sinuses short, healing was hoped for, and the wounds were dressed regularly for twenty-four days with apparent improvement. Her temperature then

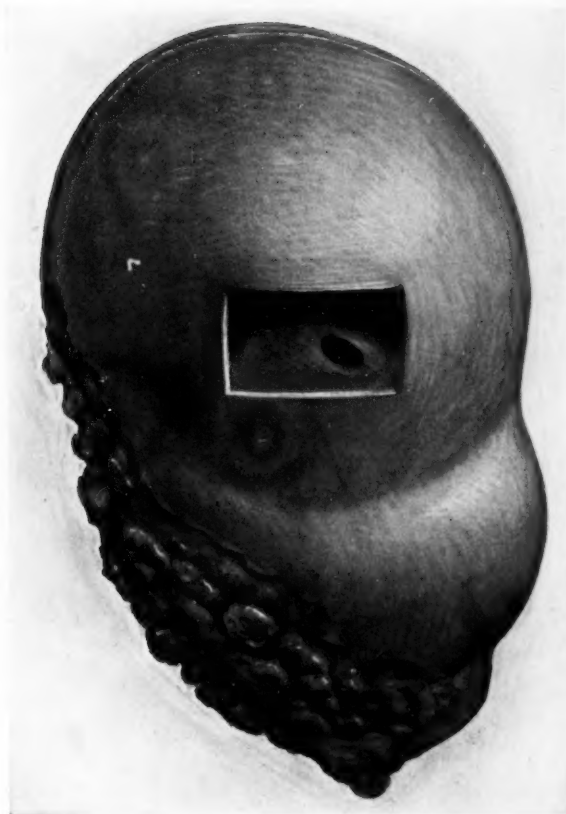


FIG. 3.—Mesenteric cyst. The small locule contained clear serum; the larger one contained chylous fluid.



INGUINAL HERNIA

suddenly rose to 104.6° , and she developed symptoms of meningitis, *i.e.*, rigidity of the neck, double Kernig sign, pupils slightly dilated, eccentric, but reacting to light; she was stuporous, complained of headache and had a disconnected idea of time.

A lumbar puncture was done, which yielded about 45 c.c. of turbid fluid, under pressure. This fluid gave a marked sediment on standing, which showed 73 per cent. of polymorphonuclear leucocytes. No bacteria were found by culture or smear.

Operation showed a slight burrowing of pus outside the bone flap, and evidence of inflammation beneath it. The bone flap was removed and the wound widely drained. The patient was desperately ill for ten days, much of the time in so deep a stupor that she had to be fed through a stomach tube. Her temperature reached 104° or higher each day; the pulse ranged between 100 and 140. The neck remained stiff and she always gave a positive Kernig and a positive Janeway sign. Although she was in a stupor, she showed the characteristic irritability when disturbed. A second lumbar puncture, made three days after the rise in temperature, showed cloudy fluid from which staphylococcus pyogenes aureus was grown, and the same organism was seen in a smear from this fluid. Another lumbar puncture, taken seven days later, gave fluid less turbid and from which no bacterial growths could be obtained.

From this time on the patient steadily improved. The cranial defect had filled in satisfactorily; the hemiplegia from which she suffered had diminished; she had gained in weight and strength and was doing well in her studies.

This patient, Dr. Dowd said, was shown to illustrate a recovery from septic meningitis, which was unusual. Neurologists tell us that these recoveries occur, but we do not see many of them. The case also serves as a striking illustration of a surgical principle that guides us in our every-day work, namely, the far-reaching effect of removing local infection. In this case the main infection was in the meninges of the motor area, while secondary infection had extended into the spinal canal, as was shown by the symptoms, the cloudy spinal fluid and the presence of bacteria, yet the patient mastered the secondary inflammation when the primary focus was removed.

INGUINAL HERNIA (NERVE DISTRIBUTION)

DR. DOWD said that recently, when he called the attention of the Society to the iliohypogastric nerve, there seemed to be a general impression that the motor branches of this nerve were given off above the

point where they could be injured in the operation for the cure of hernia. At that time he had already had dissections made and had consulted anatomists, and was confident that the nerve filaments were given off from the main nerve in such a way as to be impaired if the nerve was cut in the operative field.

Two other methods of study were available: One, the electrical stimulation of the nerve; the other, the making of serial microscopic sections across the nerve area. The first method was used on the patient he showed to-night and on four other consecutive hernia patients during their operations. One faradic electrode was placed behind the pelvic crest and the other small electrode was sterilized and applied to various spots on the internal oblique muscle and its nerves after the aponeurosis of the external oblique had been split and laid open. It was interesting to see the local action that could thus be obtained. When the electrode was applied well up toward the anterior superior iliac spine, a local contraction of considerable extent followed; when it was applied further down, a smaller local contraction resulted close to the point of contact. When the nerve was touched as it crossed the operative field, a contraction was obtained of those muscular fibres which ran toward the conjoined tendon. When a part of the nerve was raised from the muscle and laid over a piece of dry gauze and then stimulated by two sterile electrodes applied to this isolated section, a similar local reaction occurred.

Dr. Dowd said he then excised the lower portion of some iliohypogastric nerves, together with the muscle tissue in which they lay, and had serial sections cut from various portions of these specimens. In this way the nerve filaments could be seen running between the muscle bundles after separating from the main nerve trunk.

These two observations, the speaker thought, together with the dissections, seemed to him to prove conclusively that fibres are given off by this nerve within the operative field and that these fibres run to tissues which are important in the repair of hernia.

Dr. MOSCHCOWITZ said that within a day or two, while operating on a case of inguinal hernia, he tested electrically the iliohypogastric nerve for muscular distribution, and he had to confess that his results were somewhat different from those reported by Dr. Dowd. He made his experiment as follows: He exposed the iliohypogastric by careful dissection and raised it from the muscle for a distance of one centimetre. Under this he slipped a piece of perfectly dry rubber tissue. He then tested the nerve with first a mild, then a medium, and finally a strong faradic current, and in no instance was there a resulting muscular contraction. Perhaps his experiments were not carried out

PANCREATIC CYST

with as much care as they might have been, but at any rate he could not get any contraction.

Dr. Moschcowitz said he had studied the distribution of this nerve as thoroughly as possible in various anatomies; these descriptions varied considerably and none of them appeared to be absolutely correct: in the best description he had found it was classified as a sensory nerve in that part of its course where it is exposed in an operation for inguinal hernia.

Dr. ROBERT T. MORRIS said that since hearing Dr. Dowd's paper on the preservation of the iliohypogastric nerve in operating for the cure of inguinal hernia he had made some study of the condition in about ten cases and had found that the iliohypogastric nerve in this area was sometimes larger than the ilioinguinal.

Dr. DOWD, in closing, said he was sorry that the results of the experiment made by Dr. Moschcowitz did not coincide with his own, which were carried out in five successive cases. With a small electrode he obtained very definite contractions, and in addition to the electrical tests, the microscopic examination of the sections gave confirmatory evidence, showing small but distinct branches emerging from the nerve trunk.

In reply to Dr. Morris' observation, Dr. Dowd said the ilioinguinal nerve was usually larger than the iliohypogastric, but the former did not possess any motor function in that area.

THE "TONGUE-DEPRESSOR" GASTRO-ENTEROSTOMY CLAMP

Dr. CHARLES L. GIBSON described this method and presented three patients upon whom it had been successfully used.

PANCREATIC CYST

Dr. BURTON LEE presented a married woman, aged thirty-nine years, who was admitted to the New York Hospital, in the service of Dr. C. L. Gibson, on May 8, 1914. Her family history was unimportant. Her past history showed a right-sided pleurisy thirteen years ago. Two years ago the patient had an attack of severe pain in the epigastrium, radiating to the left shoulder and back. She did not vomit and the pain lasted only about half an hour. A year later she had a similar attack but of longer duration. These attacks had since recurred at intervals of four or five weeks, always coming on soon after eating and relieved by self-induced vomiting. The vomitus had been brown, yellowish, greenish, and black.

The patient's present illness began five months ago, when she had

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an attack which confined her to bed for a week. The pain was then in the epigastrium, radiating to the left axilla and back. She vomited repeatedly but apparently made a complete recovery in the course of a week. A month ago she was admitted to the medical side of the hospital with a similar attack. A diagnosis of left pleurisy, with effusion, was made. Aspiration was performed, and 200 c.c. of fluid was evacuated. The patient was greatly relieved, but still complained of epigastric pain. A test meal, taken on April 30, showed free hydrochloric acid 48.3, with a total acidity of 68.3. The fasting stomach contents gave free hydrochloric acid 12; total acidity 32. Eight days before her admission to the surgical side of the hospital she complained of severe pain in the right hypochondrium, shoulder, back and right lower quadrant. There was quite severe pain and tenderness in the right hypochondrium. She vomited many times, the vomitus being yellow and green. Physical examination showed a normal thorax. The abdomen was not rigid, but there was tenderness on deep pressure in the right hypochondrium, in the anterior axillary line and in the epigastrium. No masses were made out.

Operation, May 15, 1914, by Dr. Lee: With the patient in the dorsal position an incision four inches long was made over the right rectus in the gall-bladder region, and, upon exposing the peritoneal cavity, the gall-bladder was readily found. It was apparently normal, without stones or adhesions, and could be readily emptied. The stomach showed nothing abnormal. Upon passing the hand to the left, however, a rounded, fluctuating mass could be felt. It appeared to be cystic and was situated well to the left side. A second incision, five inches long, was made through the left rectus, and an effort was made to reach the mass through the gastrohepatic omentum, but this proved unsuccessful. The gastrohepatic omentum was then pulled upward and an opening made into the mesocolon posteriorly, and the mass readily exposed. It was reddish in appearance, with grayish patches. A small needle was inserted into it, withdrawing a non-purulent, serous fluid, which was removed with the sucker. The last part of the contents of the cyst was a little more turbid and somewhat purulent. The mass was regarded as either a subphrenic purulent accumulation or a pancreatic cyst, with subsequent abscess formation. A cigarette drain was passed into the cyst cavity and then through the great omentum just below the stomach, emerging from the upper angle of the wound. The wound was closed in layers with chromic catgut, with interrupted silkworm gut for the skin. The patient's convalescence was uneventful, and she was discharged on June 19, 1914. Her con-

SUBCUTANEOUS RUPTURE OF THE JEJUNUM

dition at this time was markedly improved: she was free from pain, her appetite was good and she was gaining in weight and strength. At the present time the patient was apparently in good health and her appetite was excellent. At times she had a little burning and distress in the epigastric region, but not enough to give her serious discomfort. Pathological examination of the fluid evacuated from the cyst showed a growth typical of the staphylococcus albus.

DR. WILLIAM A. DOWNES mentioned a case where after opening the abdomen and removing a large number of gall-stones he noticed that the pyloric end of the stomach was unduly prominent, and upon investigation a distinct fluctuating mass was discovered which proved to be a pancreatic cyst lying between the stomach and colon. It contained about one pint of fluid. Nothing in the history had suggested this condition and as the patient was quite stout it was not felt upon palpation.

SUBCUTANEOUS RUPTURE OF THE JEJUNUM

DR. LEE presented a man, forty-five years old, who was brought to the Hudson Street Hospital on October 26, 1914, and admitted to the service of Dr. Francis Murray. The history obtained was that about three-quarters of an hour before his admission he was struck over the lower abdomen by an oak slab, about one foot long and four or five inches thick. The blow was delivered with great force, the slab having been caught in a revolving saw and hurled with tremendous velocity. It struck the man in the lower abdomen, knocking him prone to the floor.

When examined on admission, he appeared to be in great pain and somewhat shocked. He was trembling, very pale, with a pulse of 100 and feeble. His temperature was 99°. The pupils were somewhat dilated. The breathing was entirely thoracic. Examination of the abdomen showed generalized board-like rigidity, and pressure elicited exquisite tenderness most marked just above and to the right of the umbilicus. Percussion gave a small area of dulness low down in both flanks. The patient was catheterized, and six ounces of perfectly normal urine were withdrawn.

An immediate exploratory laparotomy was done by Dr. Lee through a long right rectus incision, and, upon entering the peritoneal cavity, a quantity of bloody fluid and a number of blood clots were found. Search revealed a rupture of the small intestine, probably the jejunum. The rupture was transverse and involved at least three-quarters of the lumen of the intestine. The mesentery in the region of the rupture

was contused and ecchymotic, and at another point lower down, the outer coat of the intestine showed the same condition. End-to-end anastomosis was performed by a running suture of Pagenstecher through all the coats, and then by a Cushing suture through the two outer coats, and, lastly, another Cushing suture was placed over the first, making good peritoneal approximation.

The blood clots were sponged from the peritoneal cavity and the free fluid removed by means of the sucker. The intestine was replaced, the peritoneum closed by a running suture of catgut, the muscles by interrupted sutures of chromic gut and the fasciá by interrupted sutures of silkworm gut and by a running suture of catgut. No drain was used. Time of operation, 45 minutes. Hypodermoclysis was employed on the day of the operation, and four ounces of saline, with one drachm of glucose, were given by rectum daily until November 2, when he was put on fluid diet.

Three days after the operation and for two days following the patient had several attacks of hiccough which were relieved by lavage. Convalescence was otherwise uneventful save that there was a slight purulent discharge at the lower angle of the wound: this, however, was superficial, being confined to the subcutaneous tissue, and the wound closed completely on November 7, twelve days after the operation.

At the present time, December 9, 1914, the patient had a firm scar; there was no abdominal discomfort and the bowels were regular.

OCCLUSION OF THE PYLORUS

DR. C. L. GIBSON and DR. FENWICK BEEKMAN read a paper with the above title, for which see page 423.

DR. MORRIS said he wished to call attention to one point in connection with exclusion of the pylorus. If we tied a strong silk cord firmly around the lower part of the pylorus, sufficiently tight to cut the mucosa, we would have a subsequent scar that will assist in the contraction of the parts.

In doing this operation on the pylorus, Dr. Morris said, the homoplastic flap was the one that had appealed to him. After the receipt of a copy of an abstract of Dr. Gibson's paper a few days ago, he was called upon to do a gastro-enterostomy, and in the course of the operation he dissected out enough of the falciform ligament to permit him to make a turn and a half about the pylorus: this ligament carried its own blood supply and when twisted in this way about the pylorus it made a very firm, and, he hoped, permanent constriction. Dissection of the

OCCLUSION OF THE PYLORUS

ligament begins at the navel, leaving the cephalad end attached, and this gives five inches of lining ligature larger than a lead pencil in diameter.

DR. GEORGE A. WOOLSEY said that von Eiselberg's statistics were rather noteworthy in that his cases of exclusion of the pylorus gave a considerably larger proportion of peptic ulcers of the jejunum than cases with gastro-enterostomy without exclusion. There were cases, undoubtedly, where exclusion was a valuable adjunct to the operation, and the speaker said he did not think we should overlook von Eiselberg's original idea in introducing it for certain cases of gastric carcinoma. In cases of carcinoma of the stomach not suitable for partial gastrectomy the best thing we could do was unilateral pyloric exclusion and a Reichel or Polya or a simple gastro-enterostomy. The latter by itself was not of as much service as was desirable. If the ulcerated area in the stomach could be excluded, these patients were much more apt to improve, for their appetite and digestion were far better. Then too in suitable cases a second operation could be done, removing the carcinoma and making a two-stage gastrectomy with safety to the patient.

As to the technic of pyloric exclusion, Dr. Woolsey said that in a recent case where he followed the Wilms method by the transplantation of a fascial flap, a subsequent X-ray did not indicate that perfect occlusion had been secured, nor did he think that was needed. It was not at all necessary for the occlusion to be water-tight. What was wanted was to rest that part of the alimentary tract and protect it from chemical and mechanical trauma, and an absolutely tight anatomical closure was not necessary.

DR. GEORGE E. BREWER said he was firmly of the belief that pyloric closure was only indicated in a comparatively small number of cases, and in his own experience, particularly with duodenal ulcers, a simple gastro-enterostomy had given very satisfactory results. He could not, at the moment, recall a single case where exclusion of the pylorus would have been an added advantage.

In dealing with duodenal ulcers causing severe hemorrhage he thought it advisable to close the pylorus in addition to doing a gastro-enterostomy. He had had an opportunity of seeing von Eiselberg perform this operation by his method, and in that instance it took him a good deal longer to do the exclusion than the gastro-enterostomy. In patients who have suffered from recent severe hemorrhages from duodenal ulcers, time was a very important element, and for that reason he was in favor of simply infolding the tissues by a ligature over a metal band. He had tried this method seven or eight times on ani-

mals, and in every instance it was successful and gave a perfect closure, without evidence of necrosis.

DR. H. H. LYLE said that Dr. Kammerer at a previous meeting had shown X-ray plates of a stomach after the von Eiselberg operation. In these plates the lower angle to the stomach had tilted downward and formed a pouch whose level was below the gastro-enterostomy opening. Quite recently such a case had come to St. Luke's Hospital with the diagnosis of ventral hernia. In repairing the hernia an examination of the stomach revealed the condition described by Dr. Kammerer. The gastrohepatic ligament was shortened and the angle of the stomach restored to its normal level. The restoration of the level gave clinical relief and was demonstrated by X-ray examination.

Dr. Lyle mentioned this case to call attention to the necessity of providing against the sagging of the pyloric end of the stomach.

DR. A. V. MOSCHCOWITZ said that exclusion of the pylorus was a matter of particular interest to the surgeon, on account of the frequency of operations on the stomach. There was scarcely an operating day that two or three such cases were not seen at Mt. Sinai Hospital. Personally, the speaker said, he always tried to occlude the pylorus in every case where the ulcer was situated at the pylorus or in the first portion of the duodenum and where the pylorus was still patent.

As a matter of fact, no method of exclusion was perfect, not even the von Eiselberg. Some years ago, Dr. Moschcowitz said, he showed the X-ray plates of a case where Dr. Gerster had excluded the pylorus by the von Eiselberg method, and within a year after the operation bismuth was again seen passing through the pylorus. While the method suggested by Dr. Gibson was an excellent one, no method could be claimed to be ideal; no more than a partial stenosis could be permanently expected, nor was anything more than this necessary. If we could exclude the pylorus for a certain length of time, our purpose would be served. The speaker said his own method could be applied in two minutes: he merely passes some sutures through the tissues and draws them tight, puckering them, so that the anterior wall is pressed against the posterior. Some of these cases had been examined under the fluoroscope as long as six months after the operation, and no bismuth was seen passing through the pylorus.

Dr. Moschcowitz said he did not believe that much good could be expected from a simple gastro-enterostomy in ulcer of the stomach. Hartmann claimed that most of the food would pass through the new stoma providing it was made as close to the pylorus as possible. Several

MELANOSARCOMA OF THE UPPER JAW

articles referring to occlusion of the pylorus had recently come from the Mayo clinics.

DR. FREDERIC KAMMERER said he had operated by the von Eiselsberg method in eight cases, with no mortality. He agreed with Dr. Gibson that the operation occasionally proved a difficult one technically. In his own cases the gastro-enterostomy and exclusion usually occupied about an hour and a half, but he was unwilling to admit that this was about equivalent to a pylorotomy. In some of his cases, a pylorotomy would have been impossible, or would at least have proven a much more serious undertaking.

Speaking of bleeding ulcers of the duodenum, Dr. Kammerer recalled the case of a young man upon whom he did the von Eiselsberg operation after several hemorrhages. Four weeks after the operation the patient had another rather severe hemorrhage, showing that the von Eiselsberg exclusion did not absolutely prevent such an occurrence. This patient later on developed a peptic ulcer, necessitating closure of the posterior gastro-enterostomy and the establishment of an anterior opening with an entero-enterostomy. He remained in a fairly comfortable condition for about six months, when he again began to complain of pain, which only large doses of bicarbonate of sodium would alleviate. His condition now was somewhat improved, but still the result, after one and a half years, was not satisfactory. One other case had complained of pain and general dyspeptic symptoms so persistently, that a second laparotomy was done without disclosing any cause for these symptoms. These dyspeptic symptoms have continued off and on (over two years) with intervals of perfect freedom for several months at a time. All the other cases have done well. The patients have increased in weight and were relieved of all their symptoms, when seen about six months ago.

Stated Meeting, held January 13, 1915

The President, FREDERIC KAMMERER, M.D., in the Chair

MELANOSARCOMA OF THE UPPER JAW

DR. ALEXIS V. MOSCHCOWITZ presented a child, whom, he said, he had presented at one of the previous meetings of this Society, under the title "Odontoma of the Upper Jaw." He now presented him again, for two reasons: First, in order to show the result of operation; and second, in order to correct an error in the histological diagnosis.

Operation was performed November 28, in the following manner, in ether anæsthesia, after a preliminary submucous infiltration with

adrenalin. The palatal mucosa was split over the greatest convexity of the tumor, and the greatest portion of the tumor shelled out with a periosteal elevator; its extension into the superior maxilla and antrum was removed by chisel and rongeur. The specimen removed was dark, pigmented, and rather hard; it was, however, well circumscribed, and appeared to have a capsule. The cavity was packed with iodoform gauze. After the operation there was a sharp rise in the temperature, up to 105.4° F., but it soon dropped to normal after the removal of the packings. The baby was discharged from the hospital in about two weeks time. The cavity rapidly contracted, and is now completely healed.

Dr. F. S. Mandlebaum, Pathologist to Mt. Sinai Hospital, after examining the specimen reported that it was a melanosarcoma.

RESECTION OF PYLORUS AND ADJOINING PORTION OF STOMACH (ONE-HALF) FOR ULCER OF LESSER CURVATURE

DR. MOSCHCOWITZ presented a man, forty-eight years of age, who was admitted to Mt. Sinai Hospital October 23, 1914. His history dates back over five years, and his complaints were those of epigastric distress, cramp-like pains across the upper abdomen, and vomiting, the latter occurring usually within five to twenty minutes after the ingestion of food. Has vomited visible blood only once, and as it happens on the date of admission. He had been upon the medical service of the hospital six or seven months ago, and was treated for a gastric ulcer, however without any amelioration of his symptoms. The pain now is very intense, and radiates to the left and back.

The physical examination is negative, except for extreme tenderness in the epigastrium, to the left of the median line. Examination of the stomach contents after an Ewald test breakfast showed a total acidity of 70, and free HCl 37.

The conclusions of the X-ray department were the following. "The condition is probably a gastric ulcer, and in view of the retention after six hours, probably pyloric in situation."

Patient was operated on October 28, 1914. A transverse incision was made through the left rectus. Exploration revealed a hard mass, at about the middle of the lesser curvature, with its base posteriorly. Many nodes were left along both curvatures. Under the impression that he was dealing with a malignant neoplasm, resection of the distal portion of the stomach was performed.

This patient also had a very stormy convalescence, there being a great deal of vomiting during the first week, requiring frequent lavage; and once again after convalescence had been established, there was an

PENETRATING ULCER OF STOMACH

attack of vomiting, which lasted for forty-eight hours, and which very probably was due to the ingestion of smuggled food.

Patient was discharged November 20. He is now in perfect condition and has gained 10 pounds in weight.

The pathological examination of the specimen showed a callous ulcer; no malignancy.

EXCISION OF PENETRATING ULCER AT MIDDLE OF LESSER CURVATURE OF STOMACH

DR. MOSCHCOWITZ presented a man, fifty-eight years of age, who was admitted to Mt. Sinai Hospital June 1, 1914. His history dates back over ten years, but his complaints have been particularly severe only during the past two years. His chief complaints were pain in the epigastrium, which did not radiate, and which was relieved for a short time by the ingestion of food. He was frequently wakened at night, at about 11 or 12 o'clock, with very severe attacks. He vomited occasionally, but to his knowledge saw blood once only in the vomitus. Has lost 45 pounds in weight during the past ten months.

The physical examination was entirely negative. Analysis of the stomach contents after an Ewald test breakfast showed a total acidity of 70, free HCl 20, lactic acid 0. The conclusions of the X-ray department read as follows. "Both by repeated fluoroscopy, as well as on two plates taken at different times, a projection can be seen on the lesser curvature about its middle, which was taken to be a penetrating ulcer at that point."

Patient was operated upon June 6, through a median incision. A large, hard, crater ulcer was felt at the middle of the lesser curvature. The ulcer was excised, the bleeding vessels being caught and ligated as encountered. While the excised specimen was very small, the resulting defect was very large. After closure of this opening, it was seen that the stomach was so much deformed, that it was deemed wisest to add posterior retrocolic gastrojejunostomy by suture. Duration of the operation one and one-half hours.

For one week after the operation the patient vomited a great deal, requiring frequent lavage. He refused all nourishment, so that he became even more emaciated than before; finally the vomiting ceased, and he made an excellent recovery.

He now feels perfectly well in every respect; eats a liberal mixed diet, and has gained over forty pounds in weight. Particular attention was called to the fact, that in spite of perfect primary union, there is a slight hernial bulging in the upper part of the wound; the reasons for so doing will become apparent in connection with the presentation of the next case.

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EXCISION OF PENETRATING ULCER NEAR CARDIAC END OF LESSER CURVATURE

DR. MOSCHCOWITZ presented a man, forty-one years of age, who was admitted to Mt. Sinai Hospital November 19, 1914. His father died of a cancer of the liver, and his mother from some tumor of the spine. The patient's history dates back over fourteen years, when he was suffering from attacks of epigastric distress, nausea and pyrosis. This condition continued up to six years ago, when he began to complain of sharp pains, which came on about an hour after each meal, and, starting in the epigastrium, radiated to the left side of the abdomen, precordium, and left shoulder. These pains lasted for three-quarters of an hour, and very gradually subsided. There was extreme tenderness over the left hypochondrium.

Operation (November 25): Through a transverse incision through the left rectus, an indurated area was felt on the posterior surface of the stomach, near the cardiac end of the lesser curvature. Excision was decided upon, therefore the Sprengel incision was lengthened to the right. The ulcer, adherent to the pancreas, was dissected free and excised; the vessels being caught and ligated as encountered. The resulting defect was very large, in spite of the small size of the excised specimen, but was finally closed with a double row of sutures. The external wound was closed in layers. Duration of the operation one hour and thirty-five minutes.

Pathological diagnosis, callous ulcer of the stomach.

In the course of the afternoon of November 27, or forty-eight hours after operation, the patient vomited repeatedly small quantities of dark, foul-smelling fluid. In the evening a stomach tube was passed, and 34 ounces of a similar fluid withdrawn, followed by a lavage. Thereafter the stomach had to be washed repeatedly on account of the vomiting, anywhere from eight to forty ounces being withdrawn each time. The general condition of the patient rapidly deteriorated.

On December 5 the vomiting, which had ceased for two or three days, recommenced, and in addition there was also an obstinate constipation. It was decided to reopen the wound, in order to investigate the condition of the stomach. The following condition was found: Omentum and completely collapsed coils of small intestine were found adherent to the wound, so that the stomach was not even seen during this, the third operation. The collapsed intestine was traced back, until a point was reached, deep down in the pelvis, where it was constricted and angulated by a band; just beyond this constriction the intestines were enormously dilated. The constriction was liberated,

LYMPHOSARCOMA TREATED BY MIXED TOXINS

and the abdomen rapidly closed by inadequate through-and-through sutures. The condition of the patient upon the operating table was desperate. Fair but not perfect primary union resulted.

Patient's bowels moved freely thereafter, but even now after complete recovery, the patient from time to time becomes bloated, and at such times requires heroic measures to overcome the distention.

Dr. Moschcowitz added that while it is true that such recognized authorities as Kocher, Patterson and others advocate merely a gastro-jejunosomy in all ulcers of the stomach, this method does not fully appeal to him. He had therefore treated all cases of ulcers of the stomach, wherever feasible, either by excision, or by gastro-enterostomy plus exclusion from the food current. As exclusion is not feasible in this location, he had sometimes stretched a point and carried out a rather difficult and dangerous operation, in order to do justice to the principles, as he had formulated them for himself. Fortunately he had not as yet to report any fatal issue. In a number of cases he could not do either for technical reasons, and was satisfied with a simple gastro-enterostomy; the results were fully satisfactory, but the time is too short as yet for a final judgment.

In connection with these cases he called attention to the transverse incision which he had used. The incision gives perfect exposure, intestines never tend to crowd into the incision, so that no retention packing is ever necessary. It takes a somewhat longer time to get into the abdomen, and a trifle longer also to get out, but the final result, as far as cicatrix and hernia are concerned, is ideal in every respect. The third case is of particular interest in this connection, because the incision had to be reopened and resutured three times; although the final suture was anything but adequate, the result leaves nothing to be desired.

LYMPHOSARCOMA TREATED BY MIXED TOXINS

DR. WILLIAM B. COLEY presented a patient who had been suffering with an inoperable lymphosarcoma of the neck, and had been successfully treated with the mixed toxins of erysipelas and bacillus prodigiosus.

The treatment was carried out for one year from the time it was first started, 121 injections being given in all. The last injection was administered on May 13, 1914, since which time he has received no toxins. His weight has increased from 186 to 206 pounds, and his general health has been excellent. There is no evidence of any tumors or enlarged glands at present, one and a half years later.

INOPERABLE INDURATED ULCER OF LESSER CURVATURE OF
STOMACH: JEJUNOSTOMY

DR. HOWARD LILIENTHAL presented a man, forty-eight years old, who had been admitted to Bellevue Hospital on May 15, 1914. There had been pains in the stomach from one to three hours after meals during the last six years, the pain radiating to the back, and there were occasional remissions. There had also been loss of weight.

The patient had been operated upon in Roosevelt Hospital, and on communicating with that institution it was found that the diagnosis had been indurated ulcer of the posterior part of the stomach on the lesser curvature. Gastro-enterostomy had been performed but without relief.

The patient complained bitterly of the pain and was ready for any operative procedure.

Physical examination showed a fairly well-nourished man with a median laparotomy scar; no tenderness; no masses.

With the idea of resting the stomach Dr. Lilienthal performed jejunostomy in local anæsthesia with novocaine, on March 26, 1914. Digital examination at this time confirmed the diagnosis of the gastric condition. There was now gradual improvement with gain of weight. Early in July stomach feedings supplementary to the jejunal ones were permitted and the gain in weight became more rapid, the appetite improved and the attacks of pain disappeared. At the earnest request of the patient the tube was left out and the jejunal opening closed spontaneously. The old pain, however, returned, and, on September 18, 1914, the patient was admitted to the Medical Side of Mt. Sinai Hospital for duodenal feeding through a stomach tube, which it was hoped would find its way into the pylorus or stoma, the tube used being the narrow calibred one of the Einhorn duodenal bucket. The feedings were not satisfactorily carried out, but under careful medical supervision there was steady improvement and cessation of pain.

On December 5, 1914, in nitrous oxide and ether anæsthesia, there was an operation for indurated fistula *in ano* and the patient was discharged from the hospital about three weeks later.

While it is difficult to say which treatment or which operation contributed most to the relief of this case it was Dr. Lilienthal's impression that these cases should all be treated by duodenal feeding through the mouth before any surgical procedure, except perhaps an exploration, should be undertaken. This case was presented because it was one of those in which Dr. Peck would be personally interested since it was one of those on his list.

BILATERAL EXCLUSION AND OCCLUSION OF INTESTINE

MELANCHOLIA RELIEVED BY TREPHINING

DR. ROBERT MORRIS presented a young woman, twenty years of age, who had received a simple depressed fracture of the right parietal bone ten years previously. Little significance had been attached to the depression which remained, although the patient sometimes had a feeling of discomfort in that region. Last spring she developed melancholia with destructive features, and had to be kept continually under guard. Her physician and Dr. Morris were both impressed by the fact that the patient when moving aimlessly about had a tendency to place her hand at the site of the skull defect. Alienists who were consulted were much opposed to operation, but this was done at the Post Graduate Hospital in August last. The depressed area of skull was elevated, dural adhesions were separated, and a piece of Cargile membrane was introduced for the purpose of preventing recurrence of adhesion. The patient had begun to improve definitely about a week later, became entirely well, and had remained well up to the present time, with no evidence of psychosis remaining.

SKIN GRAFTING AFTER REMOVAL OF TATTOO MARKS

DR. EDWARD M. FOOTE showed a patient from the back of whose hand he had removed a tattoo mark twenty months previously, immediately covering the raw surface with Thiersch grafts taken from the thigh. The tattoo marks were in the form of a square on the back of the hand, measuring about two inches on a side. Attempts had previously been made to obliterate them by chemicals and the result was a disfiguring scar with an abundance of red and blue pigment scattered over it.

Dr. Foote dissected the skin of the entire area with scalpel and forceps, deep enough to remove all pigment. In a part of the wound area the whole thickness of skin was removed; in a part the lower portion of the derma was removed. The result of the skin grafting was a non-pigmented, movable and flexible skin, somewhat thinner than normal skin, closely resembling in appearance the skin of the aged.

BILATERAL EXCLUSION AND OCCLUSION OF THE INTESTINE

DR. FREDERIC KAMMERER presented a man, who came under his care in 1895. During the course of that year he had been operated on several times for appendicitis, with the result that a fecal fistula had become established, through which a large part of the intestinal contents were discharged. In February, 1896, an attempt was made to close the

opening in the intestine, after extended dissection of the parts, which failed. On account of the dense adhesions found at this operation the speaker decided upon an intestinal anastomosis as the best means of relieving the condition. Some weeks later the ileum was divided about six inches from the ileocaecal valve, the distal end closed and the proximal end implanted into the middle of the transverse colon. (The case has been minutely described in the *Medical Record* of February 20, 1897 and July 1, 1899.) As a result of this operation by far the greater part of the faeces were evacuated by the anal route. A second attempt to close the fistula in the iliac region, made at this time, also failed. In December, 1896, the abdomen was, therefore, reopened, the transverse colon divided at a point immediately before the implantation of the ileum into it and the ends closed by suture. Thus six inches of the ileum, the entire ascending colon, and half of the transverse colon were entirely excluded from the fecal circulation, an outlet for the secretions of this part of the intestinal tract still existing in the large fistulous opening in the iliac region. Through this opening the intestinal wall formed a prolapse as large as a fist, which, however, was easily reducible. This, more than the secretions from the intestine, which had almost entirely ceased, was the cause of much annoyance to the patient. In August, 1897, the speaker, therefore, closed the large opening by careful dissection and suture. The wound healed completely and he was able to report, four years and eight months after this last operation (*Centralblatt fuer Chirurgie*, 1902, No. 19), that the patient had been in excellent health and had suffered not the slightest inconvenience from his totally excluded and occluded intestine. Beneath the scar of the fistula, however, a soft mass could be felt, which was looked upon as an accumulation within the occluded loop.

The patient disappeared for another year, but at the end of this time he came back with a different history. He had suffered considerably, especially lately, with pain in the right half of the abdomen. The soft mass beneath the cicatrix had become converted into a large, semisolid protrusion, which seemed to be under considerable tension. Through an incision the occluded intestine, firmly adherent to the anterior abdominal wall, was opened and a large quantity of slightly tinged, yellowish material was evacuated, which had the consistency of molten wax and was absolutely odorless. Unfortunately this material was lost and cannot, therefore, be reported on. After a few weeks the fistula had again closed and remained closed for two years, when the patient again presented himself with a history of much suffering lately. He had lost in weight and was run down and, although

BILATERAL EXCLUSION AND OCCLUSION OF INTESTINE

no mass beneath the scar was demonstrable on this occasion, the speaker again incised the loop but only succeeded in giving exit to a very small amount of liquid, foul-smelling material. The patient's convalescence was delayed on this occasion, but he gradually improved, although there was very little secretion from the opening. For the past ten years the fistula now and then opens, after it has been closed for weeks and even months, and at such times discharges small amounts of a mucous material for an indefinite period before again closing. During this time the patient has remained in good health and no untoward developments have necessitated further surgical interference. The patient refuses to entertain the suggestion of removal of the occluded loop.

The speaker said he knew of only one other case, which had been observed for a long period—that of Wiesinger (*Deutsche Zeitschrift fuer Chirurgie*, vol. 100). In this case the upper part of the ascending colon, the transverse and descending colon, and part of the sigmoid flexure were entirely excluded and occluded from the fecal circulation. The patient lived for 13 years, during which time she was able to work as a housekeeper and suffered only slight occasional inconvenience. She collapsed and died rather suddenly while at the hospital under Wiesinger's care. The autopsy showed that no communication between the excluded loop and the normal intestine had formed. The loop was filled with light-colored, liquid material without odor. There were several large ulcers in the mucosa, one of which, in the transverse colon, had perforated, allowing the escape of the greater part of the contents of the loop into the peritoneal cavity, causing the collapse and death of the patient. The other cases of total exclusion and occlusion had all been done for serious pathologic conditions in the intestine, which had caused the death of the patients before a sufficient length of time for observation had elapsed. Baracz had shown in his experimental work that coils of intestine, which had been entirely shut off for 400–500 days, at autopsy still contained a large amount of foul liquid material, which later on, as in Wiesinger's case, might have led to perforation with collapse or septic peritonitis. Several points the speaker thought had been conclusively proven by these experimental and clinical observations. In no case, whether we were dealing with a normal or diseased intestine, was it permissible to do an immediate total exclusion and occlusion. When a bilateral exclusion was done, a rather large opening in the excluded loop should exist, at least immediately after operation, for the escape of secretions, and, if

the case is a suitable one, for irrigation and cleansing of the loop. After many months of such treatment, if the discharge from the fistula had entirely ceased, special conditions, as the existence of a huge prolapse in the speaker's case, might demand complete occlusion of the entire loop. In the light of Wiesinger's and the speaker's experience this operation would not entail any immediate risk after proper preparation of the excluded loop, but from the further course of both cases it followed that such patients should be kept under close observation or, preferably, that a small opening should later on be established, to guard against the sudden advent of serious complications, as in Wiesinger's case.

ARTERIAL LIGATION FOR EXOPHTHALMIC GOITRE

DR. B. F. TILTON presented two patients, as follows:

CASE I.—*Exophthalmic goitre. Ligation of three arteries.* Female; native of Hungary; married; thirty years of age. Was admitted to St. Mark's Hospital July 11, 1914, complaining of weakness, occasional fainting attacks, palpitation of heart, throbbing of neck, severe sweating, and diarrhoea. Has had four children, youngest two and one-half years old. Patient dates her illness back to two years before, when she was much concerned over her father's serious illness. At that time she first noticed palpitation of heart and fainting attacks. She gradually gave up her housework. Eight months ago noticed a small swelling in front of neck, also tremor of hands. Six months ago all symptoms became intensified and she was treated by rest and tonics at home for three months. She was given several times the Beebe-Rogers serum. She then went to a hospital, where she was under observation for three weeks, and then operation was advised, as she was growing steadily worse. Before operation her pulse averaged 110 and her weight was 119 pounds, having lost in two years 45 pounds. On July 21 last the two superior thyroid arteries and the right inferior thyroid were tied under local anæsthesia with 1 per cent. novocaine. There was considerable aggravation of all symptoms at first, the temperature rising to 102° and the pulse to 140. This reaction subsided promptly, and when she left the hospital three weeks later her pulse averaged between 90 and 100, her temperature was normal, and all symptoms showed beginning improvement. At the present time, six months after operation, she is vastly improved. Her weight is now 150 pounds, a gain of thirty pounds, her pulse is much slower, she has no throbbing in the neck, her appetite is good, no diarrhoea and no attacks of fainting. She

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still complains of some nervousness in diminished amount, especially from some excitement or irritation. No goitre can be felt. Exophthalmos has never been noticeable.

CASE II.—*Exophthalmic goitre. Ligation of 3 arteries.* Female; native of Russia; thirty-four years old; married; four children. Was admitted to St. Mark's Hospital, December 29, 1914, complaining of precordial pain, nervousness, insomnia, throbbing in neck, sweating, tremor and diarrhoea, with occasional attacks of vomiting. These symptoms began a year before, had grown steadily worse in spite of medical treatment. No serum therapy had been used. She stated that she had lost 60 pounds in weight. This patient presented many symptoms of Graves's disease and most of them in a very exaggerated form. This was true particularly of the nervousness, tachycardia, pulsation in the neck, and tremor.

On December 31, I ligated the two superior thyroids and the right inferior thyroid gland under 1 per cent. novocaine. The patient has shown remarkable improvement in the past two weeks since the operation. The exophthalmos is still evident, but the nervousness, tachycardia, pulsation in the neck, tumor, and tremor have diminished very materially in this short time. I believe we may confidently expect a cure without further operation.

Dr. Tilton added that his preference was for ligation of three arteries under local anæsthesia at one sitting and the employment for this purpose of a single transverse incision just as in performing thyroidectomy: He did not think that repeated ligations were practicable in hospital patients, as they will usually refuse a second operation and then a complete cure is not obtained. He did not believe that in most cases immediate or subsequent removal of the gland is necessary if the three arteries are tied. Separate incisions for the various arteries means more mutilation. In his experience the operation under local anæsthesia does not produce a serious reaction. The results that he had obtained from ligation of these arteries are materially better than those from ligation of one or both superior thyroids and the reaction is not materially greater.

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DR. CHARLES H. PECK read a paper with the above title, for which see page 406.

TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, December 7, 1914

The President, DR. JOHN H. GIBBON, in the Chair

SNAPPING SHOULDER

DR. PENN G. SKILLERN, JR., presented a man thirty-two years of age, a horse-back rider, who was first seen by him two months ago. Three months previous to that time he had fallen from a horse, but it was not until some time afterward that he complained of pain. During examination there was noticed a marked "snapping" of the shoulder—a definite shock or jar—upon elevating the arm to right angle and upon dropping it; skiagram negative. Dr. Skillern said that he had been able to find but one similar case in literature. This is reported by Reich in 1913, at Frankfort. Upon operating Reich found an abnormal fissure between the short head of the biceps and the coracobrachialis muscles. He accounted for the snapping by assuming that in abduction of the arm one or other of the tendons caught upon the lesser tuberosity of the humerus. He furthermore thinks there is a small breach at birth between the two tendons and that the accident served to increase this gap. He, therefore, proposed the term "*Schnappschulter*," or snapping shoulder. The sound is best obtained by elevation of the arm.

FRACTURE OF CONDYLOID PROCESS OF MANDIBLE

DR. ROBERT H. IVY remarked that fracture of the condyloid process of the mandible, while not extremely rare, is only occasionally met with, and receives little consideration in works on surgery. Most of the text-books give the briefest possible mention to the injury. Nearly all cases occur by indirect violence, from an upward blow on the anterior portion of the opposite side of the lower jaw. Roe¹ states that in 41 cases of fracture of the mandible examined by him 6 were through the condyloid process, an unusually high proportion of almost 15 per cent. Egger² has compiled statistics from various sources, giving the

¹ Roe, W. J.: ANNALS OF SURGERY, August, 1903, p. 221.

² Egger, F.: Beitr. fur klinisch. Chir., 1913, lxxvii, 294.



FIG. 1.—Skull, showing fracture of condyloid process of mandible (Cryer).



FIG. 2.—Anterior view of skull shown in Fig. 1. Horizontal displacement of condyle is seen on left side (Cryer).



FIG. 3.—Posterior view of disarticulated mandible, showing typical deformity in fracture of left condyloid process (Cryer).



FIG. 4.—Lateral view, showing fracture of left condyloid process of mandible. (Röntgenogram by Dr. Pancoast.)



FIG. 5.—Anteroposterior view, showing fracture of left condyloid process of mandible. (Röntgenogram by Dr. Pancoast.)

FRACTURE OF CONDYLOID PROCESS OF MANDIBLE

frequency of this fracture as 4.5 per cent. in 365 cases of single fracture of the mandible. In combination with other fractures of the lower jaw, fracture of the condyloid process occurs more frequently, the proportion of cases of multiple fracture with this injury being about 10 per cent., according to Egger's figures. But in counting the total fractures in these cases the percentage falls to about 5. Of 45 cases of fracture of the mandible recorded at the Philadelphia General Hospital from 1904 to 1908, together with at least 20 others personally examined by the writer within the last four years, only one—to be reported here—was of the condyloid process, a proportion of less than 2 per cent.

Roe, together with other writers, speaks of the frequency of this injury as a cause of ankylosis of the temporomandibular articulation. It would appear that no attempt has been made to classify the fractures as extracapsular and intracapsular. This distinction is of some importance, as the extracapsular fractures would naturally not be so liable to be followed by ankylosis as the intracapsular.

Egger states that fractures of the condyloid process generally occur without displacement, since the fragments are usually held in contact by periosteum and soft tissues. That displacement does frequently occur is borne out by two specimens from the collection of Dr. M. H. Cryer, each of which shows the typical deformity found in these cases (Figs. 1, 2, and 3). The condyle is seen to be drawn forward and inward by the external pterygoid muscle, bringing the upper fragment into a transverse and horizontal position, the portion of the process below the fracture being pulled upward and outward by the masseter, union having taken place with the fragments in this position without ankylosis. One of these specimens well illustrates also the deviation of the chin toward the injured side, first mentioned by Heath.³

The following case has recently been under the writer's care:

C. B., aged fifty-eight; male; white; teamster. Was kicked by a horse on the chin to the right of the median line. This resulted in an area of pain and tenderness at the place where the blow was received, and in a second area of pain and swelling on the left side of the lower jaw above the angle. The pain in the latter region was increased by attempts to open the mouth, which could only be done with difficulty. The patient applied for treatment at the Surgical Out-Patient Department of the University Hospital, on May 27, 1914, the day after receiving the injury. Examination showed some contusion of the soft parts in the

³ Heath, Christopher: *Injuries and Diseases of the Jaws*, 4th Ed., 1894.

canine region of the lower jaw on the right side. No crepitus or other signs of fracture were found in this region, and the X-ray was also negative. On the left side, there was a moderately extensive, puffy, tender swelling just below the zygoma immediately in front of the ear. Deep pressure elicited a point of greatest tenderness just below the normal position of the condyle of the mandible. The lower jaw was not fixed, but could be moved up and down with difficulty. Crepitus was felt at the point of greatest tenderness when this was done. On pressure over the region of the condyle when the jaw was opened, the normal forward movement of the condyle could not be felt. The lower incisor teeth were seen to be deviated toward the left side about half the width of a tooth. The X-ray (Figs. 4 and 5), by both lateral and anteroposterior views, showed a fracture through the left condyloid process of the mandible, somewhat low down, away from the head of the bone. In the lateral view, the upper fragment was apparently drawn forward, producing angulation at the site of fracture.

Treatment.—In view of the very slight deformity present, it was thought advisable to treat the case, at first at least, by simple restriction of movement by means of a modified Barton bandage, not too tightly applied, with instructions to the patient to use the jaw with moderation. By this means it was hoped that ankylosis would be avoided, though it was not greatly feared, as according to the X-ray and clinical signs the fracture was apparently extracapsular. As time went on, no other treatment was found necessary. The condition steadily improved, at the end of five weeks all bandaging was discontinued, the patient was free from pain, and could open the jaws to the normal extent. The very slight deviation of the chin toward the injured side remained, but caused no inconvenience. The condyle probably remained out of its normal position in the glenoid fossa, as a slight depression could be felt in this region instead of the usual prominence.

The case appears worthy of note, particularly on account of the absence of ankylosis, and the good result obtained with simple bandaging. It may be compared in many points with the anatomical specimens shown. The simple line of treatment carried out was suggested largely by the functionally good result evident in Dr. Cryer's specimen. In the literature I find that Roy⁴ reports a case treated very similarly to this with equally good results. In no case is absolute fixation of the lower to the upper jaw by means of interdental splints advisable, owing to the proximity of the fracture to the joint with consequent danger of ankylosis.

⁴ Roy, M.: *L'Odontologie*, 1913, xlix, 481.

FRACTURE OF CONDYLOID PROCESS OF MANDIBLE

Moderate movement should be permitted in all cases. Where there is extreme displacement of the upper fragment owing to excessive violence, or ankylosis seems unavoidable, excision of the condyle is probably advisable, followed by arthroplasty.

From a study of the skull in which the deformity is so well shown, Cryer suggests that by an anteroposterior X-ray view the horizontal position of the upper fragment should be readily seen, thus confirming the diagnosis of fracture of the condyloid process. Great care must be observed to have the patient's head in exactly the right position in taking the X-ray picture, or the condyle will be overshadowed by the dense bone at the base of the skull. This unfortunately happened in my case. The anteroposterior view taken in every suspected case of fracture of the condyloid process will frequently be of assistance in establishing the diagnosis. By making several plates at slightly different angles it should be possible to show the displaced condyle.

The differential diagnosis of fracture of the neck of the condyle from luxation without fracture should present no difficulty. In fracture there is usually crepitus, the jaws can be closed, while the chin is deflected toward the injured side. In dislocation, the jaws are held open, the chin is deflected away from the injured side, and the condyle makes a distinct prominence well in front of its normal position, though this may be masked by the amount of traumatic swelling present.

DR. JOHN B. ROBERTS said that last summer he saw a lady who said she had recovered from a fracture on the left side of the face. She said she had slipped and struck that portion of her head against the corner of a table, and was told that there was a fracture of the lower jaw near the joint. She had looked upon it as a mere contusion. She then went, at the suggestion of her physician, to have an X-ray picture taken, which proved that a fracture of the condyle existed, evidently from direct injury. In the case reported by Dr. Ivy the man apparently received his by indirect injury, as the kick of the horse was received on the opposite side of the chin.

DR. J. B. CARNETT said that he had recently seen a case of the fracture described by Dr. Ivy in a man of advanced years, who had fallen from a second floor window. He was unconscious—at the point of death for many weeks—and the fracture did not receive any treatment. Some months later he sought advice because of lack of alignment of his teeth. He had a depression at the area normally occupied by the head of the lower jaw and it was obvious he had sustained a fracture of some variety. Dr. H. K. Pancoast made a very excellent

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X-ray picture of his lesion. The skiagraph shows a not uncommon type of deformity in which a fracture occurs through the neck, the head rolls inward, and the bone reunites in that position.

THE PAINFUL SUBCUTANEOUS TUBERCLE

DR. H. R. OWEN (by invitation) read a paper with the above title, for which see page 451.

DR. P. G. SKILLERN, JR. said that he attended a case at the University Hospital Dispensary during the summer which was very much akin to the one described by Dr. Owen. The patient was a male, aged twenty-nine years, who for two years had had a sensitive spot at the upper outer portion of the left leg, and he had pain in the leg at night. He had had a skiagram taken and was said to have an osteoperiostitis. An X-ray taken under Dr. Skillern's direction was negative. On the upper outer portion of the left leg was a minute mole the size of a millet seed. Touched by the tip of an ordinary probe this little tumor was the seat of excruciating pain. The tumor was removed under novocaine suprarenin infiltration. A clinical diagnosis was made of neurofibroma. Histologically, the condition was a small encapsulated growth, a hæmangioma, beneath the skin. Last summer he saw a case with an exquisitely tender subcutaneous tubercle over the internal condyle of the right femur, which might have been diagnosed neurofibroma, but which cleared up under antigout treatment. The diagnosis of these subcutaneous gouty nodules must always be borne in mind in surgical cases.

DR. OWEN, in closing, said that the case which prompted him to write the paper was that of a young lady, twenty-one years of age, who had a small tumor over the patella for a number of months. It had been treated for some time by ointments. Finally the knee became so painful that a splint was applied. On one occasion the tumor had been diagnosed a ganglion and had been struck by a book with the hopes of rupturing it, whereupon the young lady fainted. The leg was thrown into a clonic convulsion by this blow. When she came under my observation she was walking with a stiff leg. She was so apprehensive of pain she would not bend the knee. Since the removal of the tumor she has had no further trouble.

NEPHROLITHIASIS IN CHILDHOOD

DR. J. S. RODMAN presented a boy of twelve years upon whom he had operated at different times for bilateral kidney stone. The boy has always been undersized but otherwise, except for whooping-cough, has been healthy, until four years ago, at which time he had a severe

NEPHROLITHIASIS IN CHILDHOOD

attack of cerebrospinal meningitis. He was confined to bed for nine weeks and most of the time was delirious. Since then more or less severe headaches have been rather frequent. During the summer of 1910 he passed bloody urine for the first time. The hæmaturia was not accompanied by any abdominal pain, and, in fact, the latter has never been present. The urine returned to normal after a course of medical treatment, only to become bloody again after a lapse of several months. He has never passed gravel and his general health has remained good despite the loss of considerable blood in the urine, which has always, during the past month, been dark red in color. There has been some sediment of late in the urine.

Physical examination showed an apparently healthy boy somewhat small for his age. A careful detailed examination showed nothing abnormal. Neither kidney was palpable, nor was there marked tenderness over either kidney area.

Examination of the urine showed specific gravity 1020, color light red; trace of albumen; no sugar; no casts; moderate number of urates; macroscopic and microscopic blood.

The X-ray report showed stones in both kidneys—one large stone in upper pole of right kidney and one large stone and two smaller ones in the left kidney. The large stone in the left kidney was in the pelvis, the other two in the other pole. It was decided to remove the stones at different times, so that, on February 10, 1911, the right kidney was attacked under ether anæsthesia through the usual oblique incision. On exposing the kidney the stone was readily felt and removed, through an incision into the cortex. Rather free bleeding was encountered, but was easily controlled by catgut sutures. The stone was hard and about the size of an almond. The wound was closed with gauze drainage.

Following this operation the boy's recovery was uneventful, after rallying from rather marked operative shock. The gauze was removed at the end of forty-eight hours and the wound stopped draining urine one week after operation. The child was discharged three weeks after operation in satisfactory condition, the wound having entirely healed. On several occasions after the operation there was blood in the urine, although it had disappeared at the time of leaving the hospital.

On November 12, 1911, he was readmitted, his health having been good in the meanwhile. His urine had not contained blood in the interim. A second X-ray examination showed, as before, one large and two smaller stones in the left kidney. On November 16 the left kidney

was exposed and the larger stone in the pelvis immediately felt. The kidney cortex was incised and a smaller calculus in the lower pole, about the size of a large pea, and a soft stone resembling a blood clot felt and removed. The larger stone in the pelvis was also removed and was about the size of a small pigeon egg. The boy lost somewhat more blood during this operation than the first, but again the bleeding stopped upon suturing the kidney, wound closed, as before, with gauze drainage. His convalescence from this operation was exceedingly stormy. Shock was profound, and for forty-eight hours suppression of urine made us fear that he would die. Cupping, external heat, salt solution and hot packs finally started elimination, but for one week his condition remained desperate. After this convalescence became established. The gauze was removed at the end of forty-eight hours, as before. He was discharged December 23, 1911, five weeks after operation in excellent condition. The wound had healed, having ceased draining urine ten days after operation. The urine report at the time of his second discharge from the hospital showed pale amber, flocculent sediment; specific gravity 1018; reaction acid; small ring of albumen; no sugar; no casts; few leucocytes; few pus cells; few epithelial cells, and a moderate number of urates. His health has been excellent since the last operation, he has grown rapidly, and, strangely enough, does not now suffer from headaches. At no time since the second operation has there been blood in the urine.

Dr. Rodman remarked that the subject of kidney stones in children had received but scant attention in comparison to the wealth of literature on the same subject in adults. Several important articles have appeared, however, during the past ten years, which deal largely with the etiology and pathology of stones. Despite the fact that most of the text-books of surgery dismiss the subject with the mere statement that renal calculus in children is common, the more recent literature would seem to indicate just the opposite. Nephrolithiasis in children is rare, but bladder-stones, with which we are not concerned in this report, are common. Age, sex, and race have some influence.

Thus, in Rafin's series of 39 cases, 2 of his own and 37 collected from literature, 5 were from one to five years, 18 from five to ten years, and 12 from ten to fifteen years. There were 24 boys and 11 girls in this series. Again, in the Mousseaux series of 77 cases there were 51 boys and 26 girls, while in Neupaner's series of 100 cases only 5 were girls.

It would seem that stone is more common in Hungary, Upper Silesia, England, Turkey, the country of Altenberg, Germany, and the

NEPHROLITHIASIS IN CHILDHOOD

town of Weida, near Jena. As to the actual etiology, much diversity of opinion is found. Ebstein believes that certain salts excreted from the blood and retained by the kidneys cause damage to the renal cells, thus forming the necessary organic material for the formation of stones. Joseph, in a report of 42 cases in infants with necropsy, found an albuminous material filling the tubules, and believes that this substance is the foundation of stone. He attributes its formation to altered metabolism. Klemperer and Brugsch speak of a renal stone diathesis which is brought about by a change in the metabolism, probably an excess of stone-forming salts in the blood stream. This diathesis expresses itself through diseases of the stomach and central nervous system. Rosenbach believes that the damage to the renal cells is not primary, as Ebstein claims, but rather secondary, due to a blocking of the urinary stream. In support of this theory Muschka states that blocking of the urinary stream produces swelling of the tubule walls and thus causes stone deposition. Kubitz believes that stones are composed chiefly of uric acid and its salts. Ebert, however, considers that uric acid infarcts are so common in infancy as to be almost physiologic. He considers that endemic conditions play an important rôle in the formation of sediments in the kidney parenchyma and pelvis. A gouty heredity is frequently found. For instance, Gibbons reports six cases of kidney stone in children, all of whom had had gouty parentage. Calcium contents of the water and gastro-intestinal disturbances may also play a part.

The pathology of renal calculus depends entirely upon whether the stones are primary or secondary. By a primary stone we mean one which forms independent of infection and is usually round or oval, smooth, without processes into the calyces, hard, and on section their structure is more uniform and artistic. The chief point of difference is that they have a lower percentage of calcium. Such a stone causes little damage to the kidney substance. The pathological changes that are found are due to congestion, and consist in thickening of the capsule, exudation into the glomeruli, cellular infiltrations, and cell degenerations. On the contrary, secondary stones, being always the product of infection, are almost invariably accompanied by grave renal destruction. According to Ebert, the most common kidney stones are composed of sodium urate. In Mousseaux's series there were, of 77 cases, 55 urate stones, 12 mixed urate and oxalate, 1 pure oxalate, and 9 phosphatic. He states that cystin and xanthin stones are almost never found in children. In the series collected by Rafin, where the chemical composition was mentioned, there were: uric acid 5; oxalic

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acid or urate 4; phosphate of lime 4; carbonate of lime and phosphates 4; urates and phosphates 2; urates and oxalates 2.

In the symptomatology of kidney stones as occurring in children one is struck by the infrequency with which renal colic is mentioned. In fact, pain does not seem to be a prominent factor. It was entirely absent in my case, and writers on the subject have mentioned its infrequency. Hæmaturia is an important symptom, as is sediment in the urine.

Certainly the diagnosis rests almost entirely upon the X-ray. Here it must be remembered that not all varieties of stone are equally impermeable to the rays. The softer uric acid stones do not, for instance, throw as definite shadows as the harder varieties. The treatment, of course, is surgical, once the stone is formed and symptomatic. Renewed importance must be attached, however, to subsequent medical treatment, as surgery cannot cure the stone-forming diathesis. There is no doubt that the kidney possesses definite solvent properties, as is shown in the experimental work of Rosenbach on oxamide stones. These substances were placed in the kidneys of dogs, and when the organs were subsequently removed marked absorption had taken place. What is true of unilateral kidney stones is also true, in general, of bilateral calculus. In a series of 76 cases, 38 were bilateral, according to Legen. Kubitz collected several series of kidney stones, reported by different authors, occurring at all ages, and found that as an average 18.7 per cent. were bilateral. An ascending infection of the sound kidney following cystitis of course predisposes to secondary stone formation. In this way unilateral stone may become bilateral, since calculus is so frequently followed by cystitis. Other case reports, as those of Nash, Jaffrey, and Parkinson, remark upon the relative infrequency of kidney stones in children. Out of 96 operations, Morris states that none was under ten years. R. C. Dunn states that in 283 cases there was only one under ten years.

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TYPHOID SPINE

APPENDICULAR OBLITERATION

DR. DAMON B. PFEIFFER presented a paper with the above title, for which see page 438.

DR. JOHN B. DEEVER said that he believed and could prove by bacteriological research, that the appendix is responsible for the majority of cases of cholecystitis. According to reports from the Laboratory of the German Hospital 25 per cent. of the cases of gall-bladder operations showed the colon bacillus.

The typhoid bacillus is next to the colon bacillus in causing infection of the gall-bladder, but that the colon bacillus predominates there is no question.

DR. JOHN H. GIBBON urged on behalf of the original title of this paper, "Obliterative Appendicitis," that it was the better title, because the paper shows distinctly that the obliteration of the appendix was probably of inflammatory origin. It is a term also that has been used right along and is descriptive of obliterative results of inflammatory change.

DR. PFEIFFER, in closing, said, in explanation of the title "Appendicular Obliteration," that it was simply to call attention to the fact that the ending "itis" in "obliterative appendicitis" is misleading, unless it is thoroughly understood that the inflammation is past. One sees obliterated appendices of recent date in which there is still an active inflammatory process; but, in the vast majority of obliterated appendices, there is no more inflammation. The object is to call attention to the fact that there are no inflammatory processes present.

TYPHOID SPINE

DR. J. B. CARNETT presented a paper with the above title, for which see page 456.

BOOK REVIEW

ABDOMINAL SURGERY. Clinical Lectures for Students and Physicians.

By THORKILD ROVSING, Professor of Clinical Surgery at the University of Copenhagen. Edited by PAUL MONROE PILCHER, M.D., A.M. J. B. Lippincott Company, Philadelphia and London.

The translator of this volume of clinical lectures has rendered a distinct service to American surgeons in presenting in English such original lectures as these of Professor Rovsing. The lectures are upon diseases of the cesophagus, stomach and liver which are amenable to surgical treatment. An account is given of the use of the gastroscope devised by Professor Rovsing, for examination of the duodenum and stomach through direct inspection. It is impossible to present a review of this book without going into more detail than is practicable. Professor Rovsing evidently has a large surgical clinic and in these pages he presents his views of the pathology of the diseases considered and describes his own personal treatment for such conditions. The book, therefore, is eminently practical and gives to the reader a good conception of this surgeon's work. The translation is a literal one, so that none of the meaning of the author has been obscured. It is wise for all surgeons to be familiar with the work of men in other clinics, both abroad and in this country. This book will serve a useful purpose in acquainting American surgeons with the work of Professor Rovsing.

CHARLES L. SCUDDER.

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